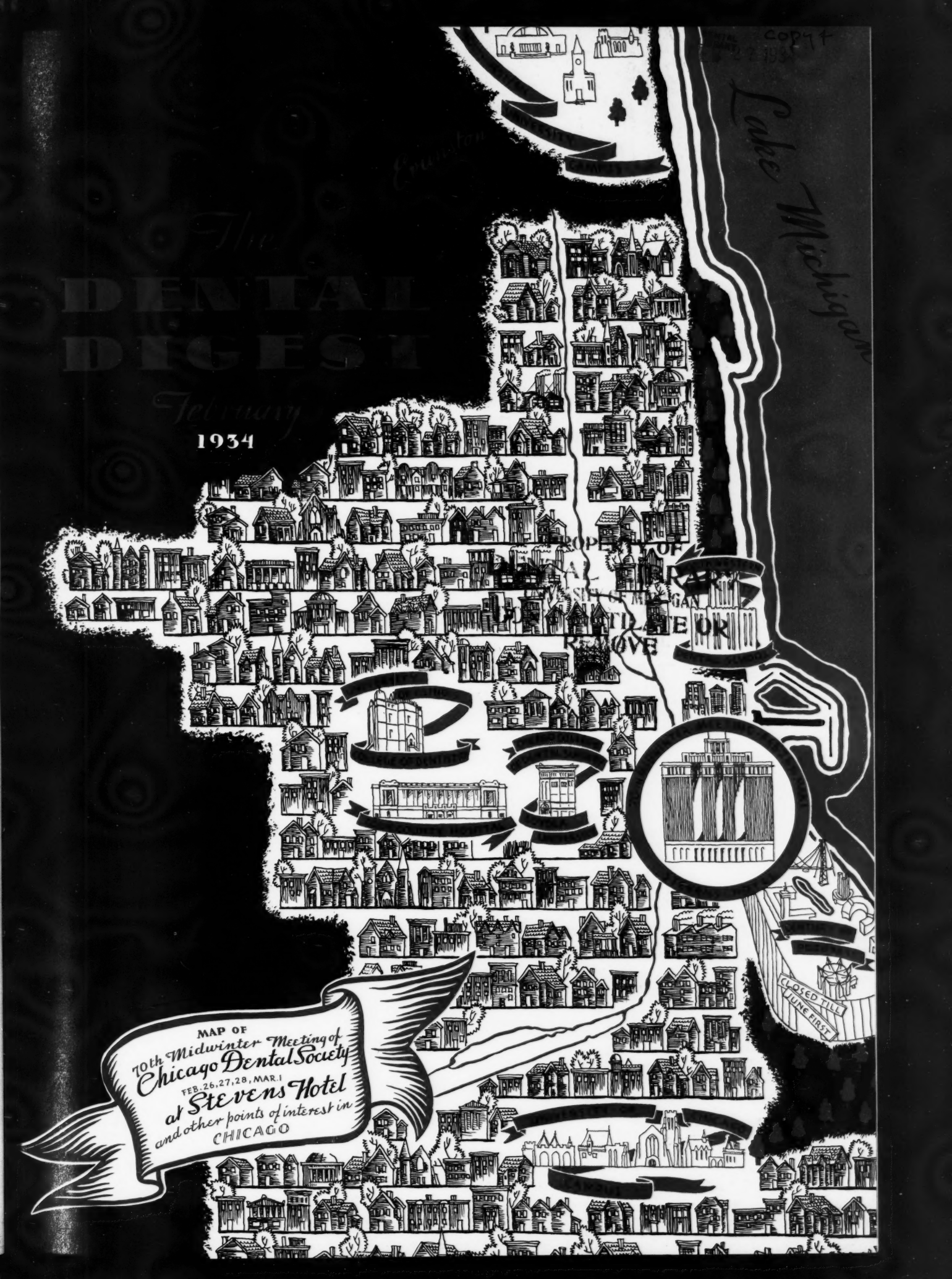
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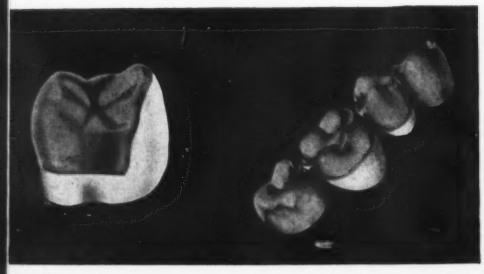

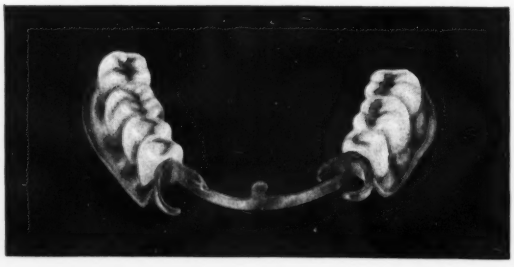

The DENTAL DIGEST

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EDWARD J. RYAN, B. S., D. D. S., Editor

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THE MANAGEMENT OF DIFFICULT CLASS FIVE CAVITIES

ELDON L. KNOX, D.D.S.
Dallas, Texas

WHAT does the general practitioner do with class 5 cavities? Is he indifferent to them? Does he dread them and pass them up? Does he feel that they can go uncared for until the next time the patient returns? Are they difficult for him to handle properly? The occurence of class 5 cavities is growing more frequent and such cavities need immediate and careful attention. Many times these cavities offer difficulties and perplexing problems, and it is my desire to offer suggestions that will overcome some of them.

Such cavities often are unusually sensitive but can be entirely anesthetized by injecting procaine hydrochloride into the mucous fold or by blocking. The procaine hydrochloride serves two purposes: (1) it anesthetizes the tooth for cavity preparation and (2) anesthetizes the tissues for making the flap. Many class 5 cavities call for local anesthesia.

Recently pertinent remarks by three outstanding men in our profession were made before classes and clinics which I had the privilege of attending. I wish to repeat these statements here and to refute them:

1. One dentist states that he did not believe in using an anesthetic in cavity preparation because of the dangers of overheating the tooth and cutting too close or exposing the pulp. I cannot agree with this statement. It might apply to a small percentage of dentists, but with the present day teachings in our colleges, surely even freshman students are aware that overheating while preparing a cavity should be and can be prevented. Moreover, every dentist has been taught the anatomy of teeth and he is sufficiently enlightened to guard against such catastrophies. About 90 per cent of my preparations are made under local anesthesia. Many times the patient aids me in deciding whether an anesthetic is indicated in the preparation of the cavity or not.

2. It was stated by another dentist that gold foil was doomed and was already dead, but that a few old fogies were still hanging on; just wouldn't give up. He stated that porcelain inlays or porcelain crowns were indicated and that within a short time there would be no more gold foils. I emphatically disagree with this statement. I believe that gold foil is coming back and coming back strongly. Everyday there is more interest taken in gold foil. I have noticed a decided change in Texas in that the gold foil is favored where indicated, and for the last three or four years I have seen a greater interest in and favoring of its use throughout the whole country.

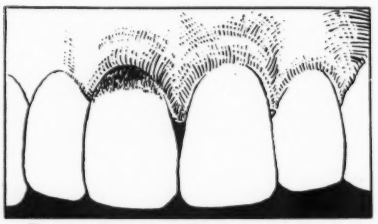

Fig. 1—Extensive decay extending apically under the free margin of the investing tissues.

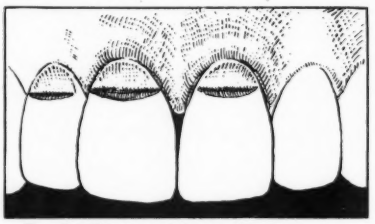

Fig. 2—Erosion of the wedge type.

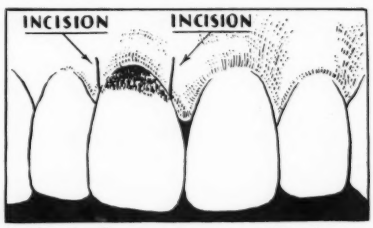

Fig. 3—Two incisions just within the embrasures.

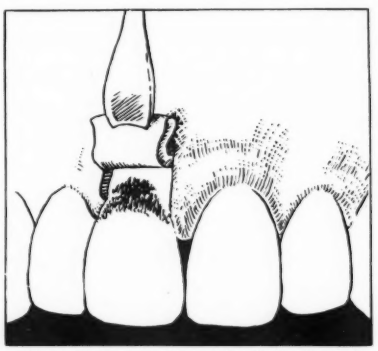

Fig. 4—Tissues turned back to form the flap. At this point the rubber dam is placed and the cavity partly prepared.

3. It was stated by the third dentist that the hardest part of a class 5 cavity is in making a restoration where the cavity extends under the investing tissues. Great difficulty is often experienced because of hypertrophied tissue extending into the cavity. The dentist also stated that the difficulty in finishing and polishing is one reason that the gold foil is not used more for class 5 cavities. If this dentist will follow the technique I am about to describe he will overcome his difficulties in these respects.

I shall not attempt in this article to advise or argue the kinds of materials to be used in class 5 cavities, but because gold foil is my preference, I will assume it is to be used. I believe that I can thus give a better picture of the technique I am to describe.

Fig. 1 shows a class 5 cavity, caries having progressed gingivally and having extended under the free margins of the tissues; the gingival tissue is hypertrophied and partly fills the cavity.

Fig. 2 shows class 5 cavities caused by erosion of the wedge type; the erosion has progressed gingivally to the attachment of the tissues.

The two types of class 5 cavities represented in Figs. 1 and 2, if handled properly, are indeed simple and the same technique can be applied to posterior teeth as well as to anterior teeth.

Technique

A local anesthetic solution is injected into the mucous fold, apically to the cavity, and should include the two adjoining teeth. The outline form of the cavity is then partly prepared.

Now, what is to be done with the hypertrophied tissue? Ought one pack the cavity with gutta percha and dismiss the patient to return in a day or so and then find that nothing has been accomplished? Perhaps the gutta percha has been lost. If not, then the tissues are inflamed and are sore and

bleed freely. Or, ought one cut this tissue off and produce a permanent injury to the dental ligament? No; it is preferable to make a flap as shown in Figs. 3 and 4. Two incisions are made as in Fig. 3; one on each side of the cavity, mesially and distally, just within the embrasures, starting at the gingival and cutting through the periosteum, to about 1.5 mm. apically from the gingival wall of the cavity.

Fig. 4 shows the flap completed with the open view of the cavity. This figure shows an exaggeration of the flap. The reason for this exaggeration is that the figure is much larger than the tooth, but in a large view of this kind the technique can be better visualized. I suggest caution in making the flap, so that it will not be larger than is absolutely necessary to place the rubber dam and the clamp in position.

Fig. 8, A, shows the Knox periosteotome, which is used to retract the tissues in making the flap. The blades of this instrument are designed to conform with the neck of the tooth. The blade is placed under the dental ligament and the tissues gently retracted affording an open view of the cavity.

The rubber dam is now placed and the cavity preparation is finished.

Much could be said about preparing class 5 cavities. I believe that Doctor Black has given a definite technique for preparing cavities caused by caries, but in eroded areas a simpler technique can be employed. For instance, the typical wedge shape erosion as shown in Fig. 2 shows extensive hard tissue destruction. The gingival is deep pulpally tapering out at the incisal one half or five eighths of the crown of the tooth. I do not believe good judgment is shown if the operator attempts to make the pulpal wall flat from gingival to incisal in equal depth throughout. It is better, I believe, to be more conservative in cutting the dentine and to make the preparation as in Fig. 13. The axial incisal step is from 1 mm. to 2 mm. deep. At the gingival axial step it may be as deep as 3 mm. or possibly 4 mm. It is useless and a waste of tooth structure to make the cavity the same depth throughout. The dentine of the axial wall should be spared to protect the pulp. I have often extended the gold foil over the outline of the cavity, making a lap joint over eroded areas, thus saving

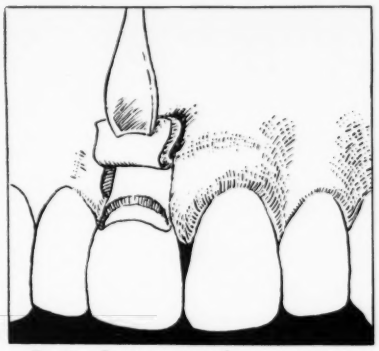

Fig. 5—Cavity prepared.

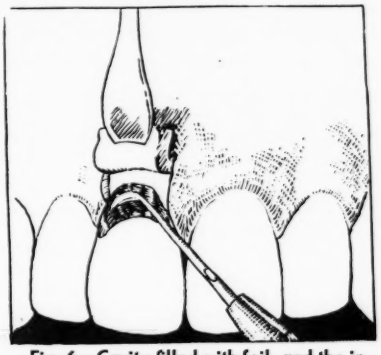

Fig. 6—Cavity filled with foil, and the instrument used for reducing and polishing the gold.

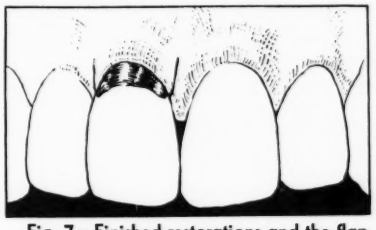

Fig. 7—Finished restorations and the flap back in place.

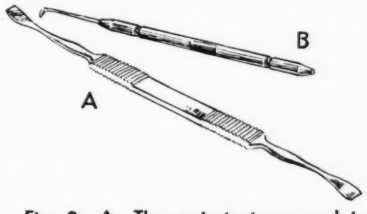

Fig. 8—A, The periosteotome used in turning the tissues back to form the flap. The blades are designed to conform with the root of the tooth. The two blades vary in size, one larger than the other. B, The claw scaler (Morse). The scaler points come in three sizes, small, medium, and large.

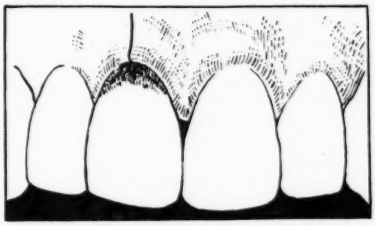

Fig. 9—The central incision with the long axis of the tooth. An incision of this type should be discouraged and not used.

tooth structure, foil, and time, and inconvenience to the patient.

Fig. 12 shows the crescent incision, which is rarely indicated in the anterior part of the mouth and its use should be discouraged. However, in the posterior part of the mouth the crescent incision may be resorted to in order to give a little better view of the cavity. The incision is made mesially and the flap turned back distally; thus a clear view is given.

Fig. 9 shows the incision made parallel to the long axis of the tooth or the median line of the tooth. Such an incision is absolutely contraindicated because the excursions of food during mastication have a tendency to pass over this part, causing pain and injury to the tissues; this will produce irritation and the tissues will recede causing a permanent injury.

Fig. 1 shows the usual bad results of the central incision. Note the ragged V-shaped gingivae and the tissue recession. Fig. 11 shows the usual result where the hypertrophied tissues have been cut off, burned or cauterized. A general recession has taken place and a general impairment of the tissues has been caused. Packing the cavity to eliminate hypertrophied tissues is usually unsatisfactory as it requires extra sittings and is painful and injurious to the tissues.

Without a description of the manipulation of the gold foil, it will be assumed here that the cavity has been properly filled and ready for the finishing of the gold foil restoration.

Fig. 8, B, shows the Morse scaler which comes in three sizes, small, medium, and large which I use in reducing the gold in class 5 gold foils. Fig. 6 shows the instrument in use. It is held with a pen grasp with the hand well braced. The cutting and trimming of the gold is done with a scraping or scaling motion; the surplus gold is cut away. At first, only a few small pieces fall, but before one realizes it he will note that the shavings of gold will form, leaving a smooth burnished surface.

In using this method of reducing the gold, the investing tissues are not injured and the polishing is accomplished without producing hemorrhages. When stones and discs are used, they etch the tooth structure and also cause a ragged abrasion to the tissues. Stones and discs also produce heat which causes pain and is unpleasant to the patient.

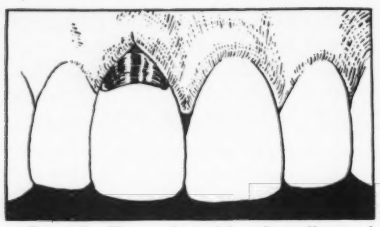

Fig. 10—The undesirable after-effects of a central incision.

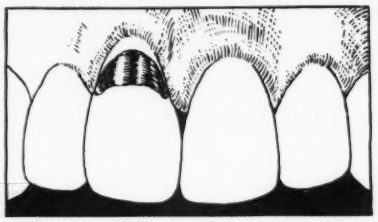

Fig. 11—The recession of the tissues where the hypertrophied area has been cauterized or excised causing an injury that is permanent and does not repair itself.

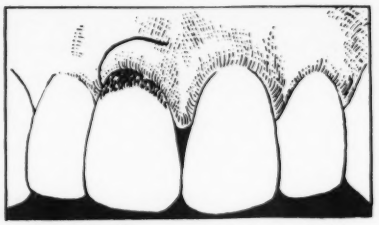

Fig. 12—The crescent type incision. Advocated for use in the posterior part of the mouth also.

As a final finish of the gold foil, one may resort to fine discs and pumice. However, this is unnecessary. The rubber dam is removed and the flap gently massaged to place. The tissues immediately adapt themselves to their normal position as shown in Fig. 7. The clotting of the blood holds the flap to place. It is never necessary to suture. Usually the second day will see the tissues completely healed. The dental ligament will regenerate, the swelling will subside, and only a slight recession will take place, which may be caused by the reduced swelling and the tissues becoming normal again.

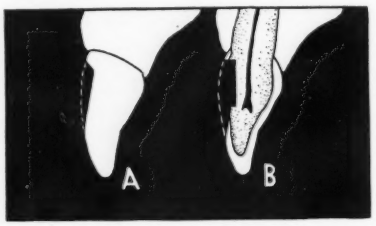

Fig. 13—The labial view of a cavity caused by wedge type erosion. B shows a longitudinal section of a prepared cavity. Note the step and conservation of the dentine.

I do not wish to convey the idea that the flap is indicated in preparing and filling all class 5 cavities, but only in a small percentage of cases. However, I resort to the flap wherever it is indicated. As I have never in my experience seen any undesirable postoperative effects, I offer no postoperative treatment. The tissues are merely massaged back to place and Nature takes care of the rest.

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POPULARIZED AUTHORITATIVE BOOKLET ON CARE OF TEETH READY

DENTISTRY AND PUBLIC HEALTH: THE CARE OF THE TEETH is a thirty-two page booklet with eighty illustrations purposely prepared for the needs of educators in their public health programs and for individual use in instruction on the care of the teeth. The following subject headings will give an idea of the scope of the booklet: *The Dentist Is The Child's Friend; What Are Teeth Like? Tooth Shock Absorbers; Each Tooth Has Its Special Duty; Why We Have Two Sets of Teeth; What Mothers Should Know About Baby Teeth; Why The Baby Teeth Are Important; When Baby Teeth Fall Out; The "Second" Teeth—When And Where They Come In; The Most Important Teeth Of All; Watch For The Sixth-Year Molars! How To Locate Them; Why You Must Guard The Sixth-Year Molars Carefully; What Foods Do For Teeth; Why Teeth Must Be Kept Clean; The Correct Tooth-Brush For Children; Give Tooth-Brushes This Care; Teach The Child To Brush The Teeth; How To Brush The Teeth; What Makes The Teeth Decay; . . . Bleeding Gums; The Causes Of Crooked Teeth; Much Pain And Sickness Could Be Avoided By Frequent Visits To The Dentist; Six Rules To Make Teeth Last A Lifetime.* Each of these subjects is specifically and clearly illustrated with diagrammatic precision where indicated.

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THE IMPORTANCE OF PREOPERATIVE ROENTGENOGRAPHIC EXAMINATION

HENRY H. SKLOW, D.D.S.
New York

THE accompanying series of roentgenograms will serve to demonstrate the extreme importance and necessity of taking roentgenograms as a routine procedure prior to all dental work, especially surgery.

In Fig. 1 an unerupted tooth was located prior to the insertion of a restoration which undoubtedly prevented future difficulty and an economic loss to the patient.

Fig. 2 shows the absolute necessity of having preoperative roentgenographic knowledge of the surgical field. If a molar is buried within the bony structure of the tuberosity, weakening its formation, and this is not known to the operator, any attempt to extract the erupted molar may result in a fracture of the tuberosity, a not infrequent manifestation.

Fig. 3 shows a residual cystic area. The tooth had been removed at a clinic without a roentgenographic examination. Failure of the socket to heal after a prolonged period prompted the taking of the roentgenogram.

Fig. 4 discloses an impaction close to the inferior dental canal. The patient had been having pain in the mandible. All necessary dental work had been faithfully and thoroughly administered by the patient's dentist. When she came to me with this history, I suggested a complete roentgenographic examination. Removal of this tooth eliminated the pain. A full mouth series of roentgenograms taken at the initial examination would have resulted in a timely diagnosis.

Fig. 5 shows a root found prior to preparation of the mouth for restorative appliances.

Fig. 1

Fig. 2

Fig. 3

Fig. 4

Fig. 5

Conclusion

These roentgenograms represent only a few of the many cases found every day in dental practice. It is still somewhat difficult to make the profession understand the value of taking complete roentgenograms of the oral cavity as an aid in restorative and preventive dentistry. Its value and absolute necessity in oral surgery should be apparent.

Roentgenography should not be regarded by members of the dental profession as something the patient may have if he or she so desires, but as something that is an integral part of progressive routine health service.

2047 Holland Avenue.

SOME PATHOLOGIC STUDIES IN THE THIRD MOLAR

R. C. MATTESON, D.D.S.
Sioux City, Iowa

THIS article[1] is a continuation of studies made by Doctor Starry[2] and me in 1929. These were studies of the pulps of unerupted teeth and also of vital teeth which carried large restorations closely approaching the pulp. These experiments were confined to studies of cultures from the pulps of these teeth. Doctor Starry reported a positive culture in about 50 per cent of the filled teeth and about 60 per cent of the unerupted teeth, and usually a pure culture of either streptococcus or staphylococcus.

During the summer of 1930 Doctor Starry examined the pulps of eight of my routine (not picked cases) of impacted third molars and made histologic slides. From these slides the photomicrographs shown here were made. These pulps were also cultured.

Pulp stone is composed of dentine (Fig. 8) and not of calcium salts and is usually caused by trauma or mechanical irritation. The calcified area occurs at the periphery of the pulp, mainly in the coronal portion and is not a true calcification. Pulp stones are frequently the cause of neuralgia and reflex pain.

True calcification takes place within the interstitial tissue of the pulp and is true calcific degeneration. Interstitial calcification follows the invasion of bacteria, with the resulting toxic and infective changes incident to focal infection.

Calcification is never found in normal tissue except in the formation of bone. When calcification is found it is in dead or diseased tissue. This deposit is composed of calcium phosphate, calcium carbonate, and magnesium phosphate. Calcification usually takes place after the fatty degeneration. Owing to the position of the tooth, the circulation of the pulp is impaired and enfeebled, and there is a decrease in the number of red blood cells which results in the fatty change. Fatty degeneration is caused by an intoxication of the tissue and usually the invasion of bacteria.

One may readily see how teeth embedded in the maxillary tuberosity may become infected. First, it may be through the roots of devitalized and infected molars; secondly, it may be from a pocket at the distal of the impacted molar itself, and third, the tuberosity is made up of cancellous bone dependent to the paranasal sinuses which make it readily accessible to toxic drainage. Hence an infection already existing in this area can easily extend into the pulp tissue of an embedded third molar. No doubt this is why more infected pulps are found in upper impacted third molars than in the lower, for the mandible is very dense bone.

Conclusion

From the observation of the results obtained following the removal of unerupted teeth, we have come to the conclusion that if unerupted teeth cannot be placed in their normal position before maturity, as by orthodontia, they should be removed as early as possible because the bone is less calcified in the young patient.

From the standpoint of histopathology and morbid anatomy, impacted teeth call for radical measures. Totally impacted teeth are virtually retention cysts with an epithelial sac, the contents of which may remain sterile, but far more frequently become infected from harboring bacteria which bring about either an acute infection characterized by abscess, cellulitis, trismus, or severe systemic infections.

[1]Reported at a joint meeting of the Woodbury County Medical Society and the Sioux City Dental Society. Internat. J. Ortho. Oral Surg. & Radiog. 15:1031 (October) 1929.

[2]Allen C. Starry, M.D., Director, Department of Clinical Pathology, St. Joseph's Mercy Hospital, Sioux City, Iowa.

711 Frances Building.

See Illustrations on Opposite Page

Fig. 1—A, Normal pulp tissue showing loose connective tissue. B, Blood vessels. Culture: No growth. (Low power magnified 250 times.)

Fig. 2—A, Numerous fat cells showing early fatty change. B, Blood vessel. Culture: Streptococci. (Low power magnified 250 times.)

Fig. 3—A, Numerous fat cells showing advanced fatty change. Culture: Staphylococci. (Low power magnified 250 times.)

Fig. 4—A, Dental pulp showing small ova of calcification near nerve fiber (B). Beginning hyperemia and dilatation of blood vessels. Culture: Staphylococcus. (Low power magnified 250 times.)

Fig. 5—A, Dental pulp showing many areas of calcification. B, Marked dilatation of blood vessels. Hyperemia caused by faulty circulation. Culture: Staphylococcus. (Low power magnified 250 times.)

Fig. 6—A, Calcification and marked sclerosis. B, Blood vessels with marked dilatation and hyperemia. C, Marked degeneration of interstitial tissue. Culture: Streptococcus. (Low power magnified 250 times.)

Fig. 7—A, Diffuse calcification. B, Marked degeneration of interstitial tissue. Culture: No growth. (Low power magnified 250 times.)

Fig. 8—Pulp stone broken by microtome knife. Culture: No growth.

Fig. 1

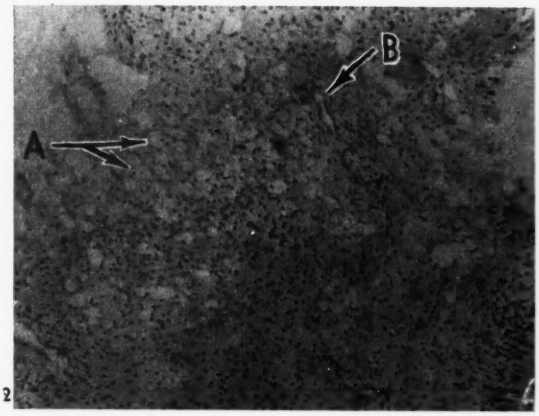

Fig. 2

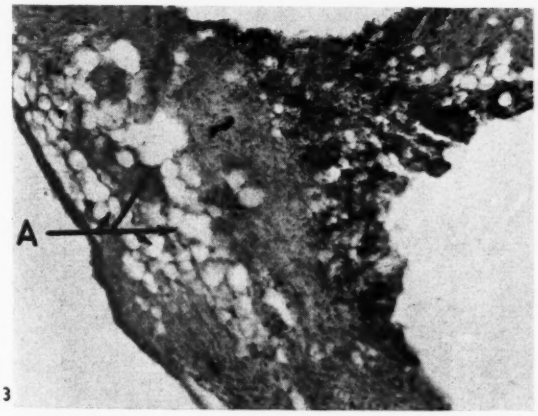

Fig. 3

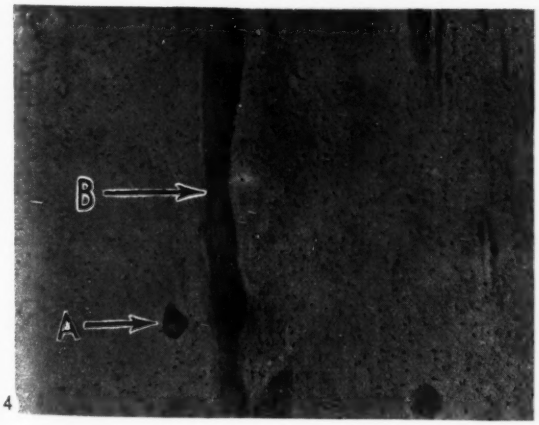

Fig. 4

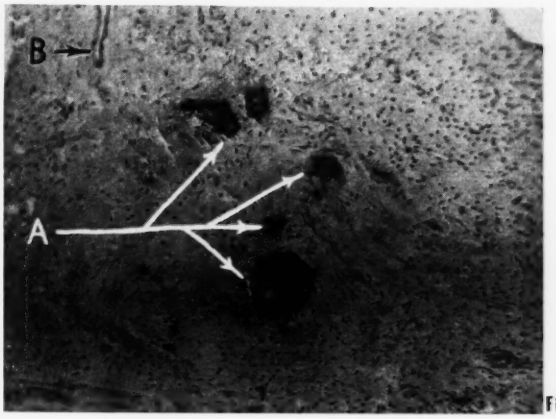

Fig. 5

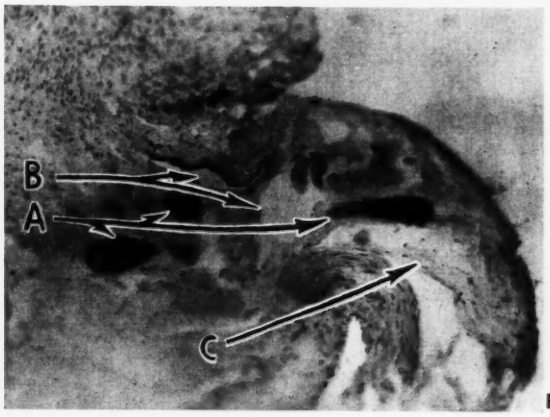

Fig. 6

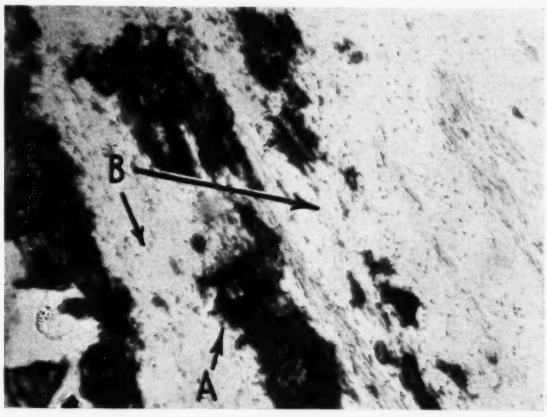

Fig. 7

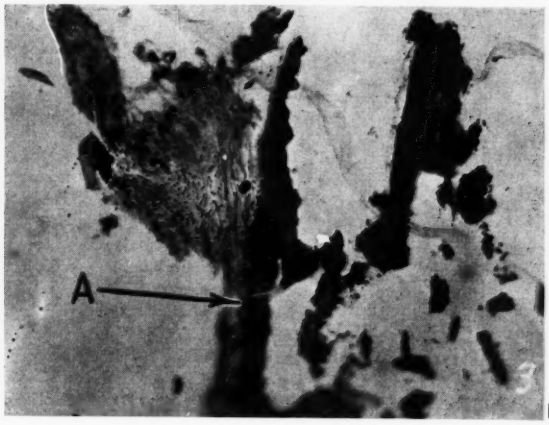

Fig. 8

THE DENTAL PULP

BENJAMIN B. KAMRIN, B.S., D.D.S.
Brooklyn

THE dental pulp is an interesting organ about which much has been written, but there is still much to be known. Owing to the difficulty of preparing material for careful cytologic and histologic studies, the odontoblasts, for example, have not been thoroughly investigated. The precise termination of the nerve filaments in the pulp is still obscure. There are many in the profession who still doubt that the organ has lymphatic drainage. Since most of the problems of modern dentistry center around the vitality of teeth, exact knowledge of the dental pulp should be of paramount concern.

In this article, it is my hope to set forth a clear-cut, concise, and substantiated picture of the dental pulp in the form of a report of the researches of authentic investigators. The report does not embody any of my original work.

Definition—The dental pulp is a soft, sensitive, supravascular organ which occupies the central portions of the root, or roots, and crown of the teeth. The dental pulp is bound on all sides by dentine except at the most apical portion of the pulp which is lined by cementum (Fig. 1).

Microscopic Appearance—During life, the pulp appears as a soft pinkish-white capsulated tissue. Postmortem changes give the pulp a grayish-white, stringy appearance.

Function—The dentine, which forms the bulk of the tooth, is a product of the connective tissue of the dental pulp. This function was, until recently, entirely bestowed on the odontoblasts; but it is now suggested that the first matrix of the dentine is developed from the fibers of Korff[1] and not directly from the odontoblasts.

The distribution of nerves in the pulp gives that organ and the innervated dentine the attribute of sensation.

The presence of a lymphatic system permits the pulp to eliminate the products of inflammation within limits.

1Korff, K. Von: Die Analogie in der Entwicklung der Knochen und Zahnbeingrundsubstanz der Saugertiere nebst Kritische Bemarkungen über die Osteoblasten und Odontoblasten theories, Arch. F. Mikrosc. Anat. **70**: 515-541, 1907.

Histogenesis[2]

The dental pulp is the evolutionary product of the dental papilla. The latter may be described briefly as a modification of mesodermic tissue which appears at the end of the tenth week (about 42 mm. embryo) of human fetal life. The tissue at this time consists chiefly of mesodermic cells and mesenchyme cells. These cells possess large nuclei and are surrounded by a small amount of cytoplasm. They are furnished with many protoplasmic branches and lie in a mucoid-like ground substance which is of jelly-like consistency.

At the time that the dental papilla is forming, the tooth germ has the appearance of a bulbous onion root. The base now begins to invaginate, and forms the depression in which the mesodermic dental pulp is formed. The cells at the sides and height of convexity of the depression are long and cylindrical in shape. These are the precursors of the enamel-forming ameloblasts or ganoblasts. The odontoblasts also appear at this time and lie below and adjacent to the ganoblasts.

Since the formation of the dentine is so closely united with the development of the mature dental pulp, the conclusions of Doctor Orban[3] will be quoted:

> The first evidence that we have of dentine development is the building of a fibrous matrix. The fibers are of the argyrophile type and are continuous with the same type of fibers found deeper in the pulp . . . (Fig. 2). We observe corkscrew-like fibers running from the pulp to the borderline between ganoblasts and pulp cells. They are argyrophile fibers, which impregnate black with silver stain, and are called Korff's fibers. As development progresses we see a dentine matrix developing from and between them. This dentine matrix, however, is not of the argyrophile type as the Korff's fibers from which it has developed, but it resembles collagen in its properties; it is acidophile . . . We see from our investigations that the *first matrix of the dentine is fibrous and not homogeneous.*

2Noyes, F. B.: Textbook of Dental Histology and Embryology, ed. 4, 1929. Bodecker, C. F.: Fundamentals of Dental Histology and Embryology, ed. 1, New York, The Macmillan Company, 1926. Mummery, J. H.: The Microscopic Anatomy of the Teeth, 1919. Orban, Balint: Dental Histology and Embryology, Philadelphia, P. Blakiston's Son, 1929.

3Footnote 2, last reference, p. 59.

The dentine formation begins about the sixteenth week of fetal life (for deciduous teeth) and from this point the transition from dental papilla to dental pulp is gradual and makes it impossible to delineate where one ended and the other began.

Histology of the Dental Pulp

Cellular Elements

Origin of Odontoblasts — The odontoblasts appear first where the epidermal cells (inner tunica of the enamel organ) are in contact with the mesodermal cells in the outer layer of the dental papilla. The odontoblasts are specialized connective tissue cells and are developed from embryonal cells deeper in the pulp which take their place in the odontoblastic layer.

Shape and Size of Odontoblasts[4] —(Figs. 2, 4, 5) A developing odontoblast is represented by a large oval nucleus and little cytoplasm. As the cell grows, the cellular cytoplasm increases to make the odontoblast pyramidal in shape with the large oval nucleus in the base. As it increases in maturity it becomes rectangular with the nucleus occupying the lower third of the cell.

The size of the odontoblasts varies considerably; coronal cells are larger and more marked than the radicular cells of the pulp; measurements show that the breadth varies from 5 to 15 microns and the length from 25 to 30 microns. In an adult pulp, however, the odontoblasts are much smaller and of spindle and fusiform shape.

Structure of the Odontoblasts—Hopewell-Smith,[4] a careful investigator, describes the cytoplasm as possessing in the lower four fifths of the cells a coarse degree of granularity. The distal end or one fifth of the cells is clear and homogeneous. He believes that granularity is due to (a) the metaplasic inclusions; (b) a coarse deep-staining reticulum or spongioplasm or (c) the dubious presence of numerous translucent globules.

The nucleus of an odontoblast is large, ellipsoidal and prominent, and

4Hopewell-Smith, A: Normal and Pathologic Histology of the Mouth, Philadelphia, P. Blakiston's Son, volume 2, 1918.

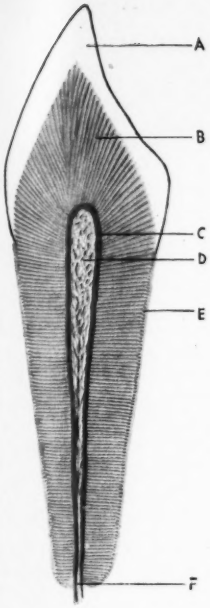

FIG 1

FIG 3

Fig. 1—Cross section of an incisor showing A, enamel; B, dentine; C, odontoblasts; D, pulp; E, cementum, and F, apical foramen.

Fig. 2—Fibers of Von Korff in developing tooth germ of cat. (Adapted from Von Korff's original illustration.)

Fig. 3—Diagram of odontoblasts and their dentinal fibers. (Adapted from C. H. Stowell in Noyes.)

Fig. 4—Active odontoblasts of a young person. A, Dentinal fibril; B, dentine; C, odontoblasts; D, intercellular substance; E, connective tissue fibers; F, connective tissue cells. (Modified from Bodecker.)

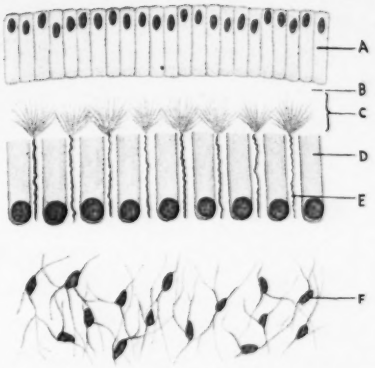

FIG 2

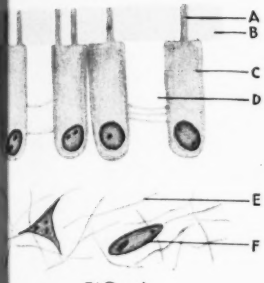

FIG 4

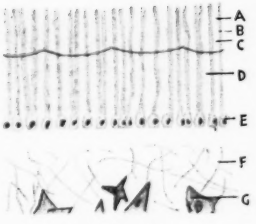

FIG 5

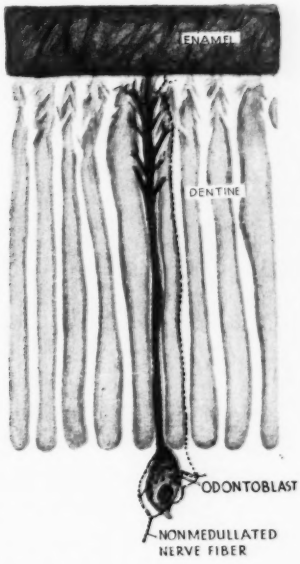

FIG 6

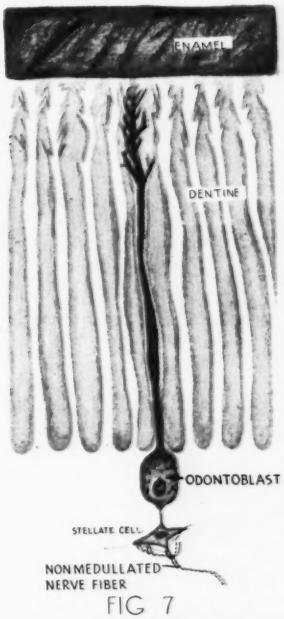

FIG 7

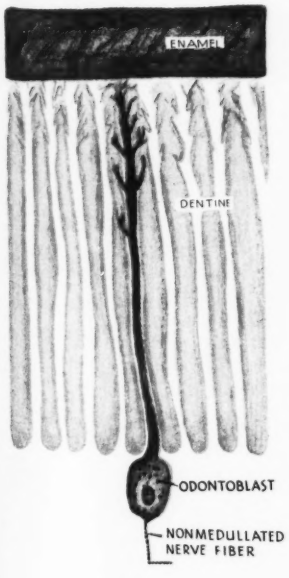

FIG 8

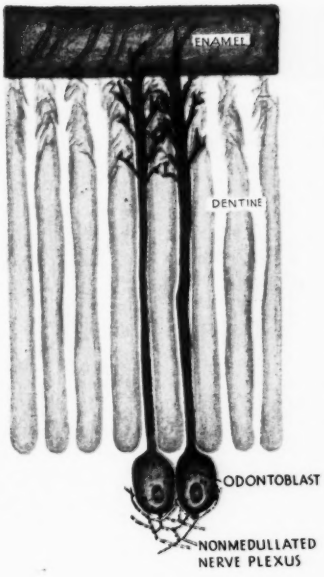

FIG 9

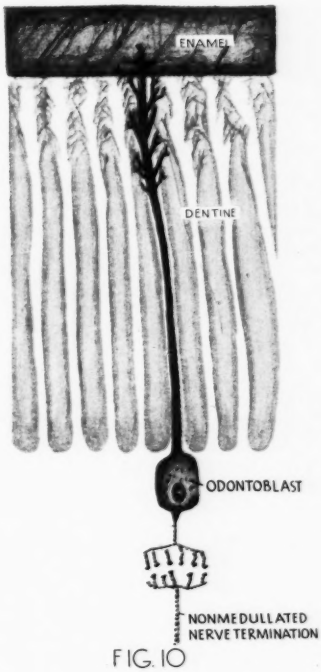

FIG 10

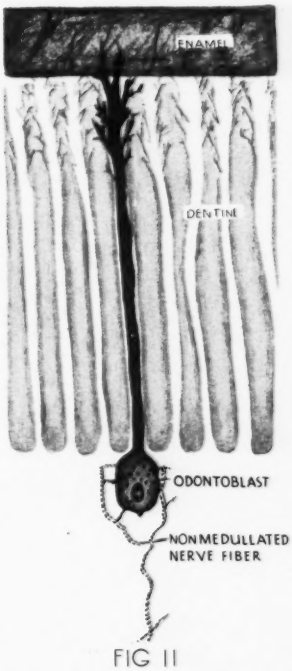

FIG 11

Fig. 5—Odontoblasts of a tooth of an old person. A, Calcified dentine; B, dentinal fiber; C, Neumann's sheath; D, secondary dentine; E, odontoblasts; F, connective tissue fibers; G, stellate cells.

Fig. 6—Diagrammatic representation of present day theory. Held by Boll, Morgenstern, Mummery, and others.

Fig. 7—Magitot's theory of nervous innervation through stellate cell intervention.

Fig. 8—Theory of Aitcheson Robertson. Direct connection with basal odontoblastic filament.

Fig. 9—Huber's conception of the termination of the nonmedullated nerve plexus.

Fig. 10—Pont's theory which states that odontoblasts resemble peripheral sensory neurons.

Fig. 11—According to Hopewell-Smith, the nonmedullated fibers embrace and are closely attached to the odontoblastic walls.

is situated in the lower or proximal third of the cell. Its wall is well-defined and its karyoplasm is deep-staining. Occasionally, nucleoli may be found.

Processes of the Odontoblasts—There are said to be three sets of processes by some histologists and others find only two; however, all are agreed on the presence of the dentinal process which continues into the dentine to the dento-enamel junction as the *dentinal fibril* (Fig. 3). The length of this fibril is usually about 4 mm. The basal process, said to exist by many, is said to extend into the layer of Weil. The lateral processes are said to unite the cells. The latter are undoubtedly artefacts.

Pulp Cellular Inclusions—Most prominent in every pulp are the so-called stellate cells (embryonic connective tissue cells). These have branching protoplasmic processes extending in every direction. The nuclei are large, prominent, oval or lenticular.

In addition, although not generally recognized, Orban[5] states that "In the dental pulp, we find the same cell elements that have been recognized and differentiated by Maximow[6] in the loose connective tissue elsewhere in the body." The cells found and recognized in the normal dental pulp are:

1. *Undifferentiated mesenchyme cells.* These cells maintain their embryonic undifferentiated character and are usually found lying alongside capillaries.

2. *"Resting wandering cell" of Maximow* (histiocyte[7]). These cells have a deceptive appearance, for in ordinary specimens they seem to be fibroblasts but in specially stained preparations, they can be identified. The cell body is granular and irregular in outline because of the protoplasmic processes. The nucleus is usually of oval shape, and has the property of storing intravital stains. The nuclei may change their shape in an irritating environment and become phagocytic active wandering polyblasts.

3. *Ameboid wandering cells.* The ameboid wandering cells closely resemble a small lymphocyte. This cell usually has a round indented nucleus, with little cytoplasm; however, in some the nucleus may be larger and kidney-shaped. These cells do not store stain nor are they phagocytes.

4. *Lymphocytes.* The lymphocytes are said to be identical with the ameboid wandering cells.

The Connective Tissue Stroma

In the embryonic pulp, the fibers that form the supporting framework are of the argyrophile type; i. e., fibers that stain black with silver stains. They are wavy in appearance and are interconnected to form a network. These fibers are a part of Korff's fibers.

In the adult pulp, collagenic fibers are found in addition to Korff's fibers. Interspersed in this network formed by the fibers and also the processes of the stellate connective tissue cells, there are found arteries, veins, capillaries, nerves, and lymphatics.

Of interest is the subodontablastic region which is known as the basal layer of Weil. Recent investigators (Orban) have ignored this so-called entity while such workers as Hopewell-Smith, Mummery, Noyes, and others still mention it. This region was first described by Weil[8] in the following words:

> The layer contains no cellular elements or nuclei; it appears rather as a net of extremely fine fibrils, which do not run perpendicularly through the layer, but running obliquely toward the deeper layers, interlace with one another in a crosswise direction . . . It may be said, with perfect security, that they arise from the projecting basal ends of the odontoblasts. It is, however, surprising that these off-shoots do not follow the axial directions of the odontoblasts, but turn sideways to one direction or another and thus form crossings.

The Vascular System

The blood supply of the teeth is derived from the posterior dental, infra-orbital and mandibular branches of the internal maxillary artery. The arteries enter the apical foramina of the teeth as one or more trunks and pass upward. Shortly after entering, profuse branching begins, until a dense, anastomosing network is formed. This continues to the periphery, where a capillary plexus is formed. Veins and medullated nerves follow the course of the arteries.

With slight variations the arterioles in the pulp resemble those found in other tissues. The difference is that the large arterioles show few muscular fibers in the tunica media and a slight condensation of fibrous tissue in the tunica adventitia. The large veins resemble the arterioles except that the middle coat is greatly reduced and the endothelial cells are shorter and broader. The capillaries are unique here. They are large and elastic; under inflammatory conditions the capillaries can expand from about 8 microns in diameter to 40 or 50 microns. The capillaries have exceedingly thin walls formed by a single layer of endothelium.

The Lymphatic System

It is rather striking to note that although Schweitzer[9] proved the presence of lymphatics in the dental pulp as early as 1907, such authors as Turner[10] and Hopewell-Smith in textbooks written in 1917-1918 did not believe in nor admit their presence. It is even more noteworthy to mention that even though Schweitzer's conclusion has been confirmed by such American workers as Dewey and Noyes[11] in 1917 and the work of Magnus[12] in Germany (1922), the majority of the dental profession still doubt the existence of dental pulp lymphatics.

The Nervous System

Despite the refined technique of the present day, the subject of the nervous system is still in a controversial state. The literature on the subject is voluminous; it appears that the investigators err in their interpretation rather than in method.

The use of drawings (Figs. 6-11) will amply illustrate the various theories. From a thorough study of present-day literature, it is my belief that Fig. 6 demonstrates the theory of innervation as held at the present time. Bundles of medullated and sympathetic nerve fibers enter the apical foramina and pass collectively into the pulp. As the fibers approach the parietes of the pulp, they break into smaller fasciculi. Near the subodontoblastic layer, the fasciculi form a close interlacing network, the so-called plexus of Raschkow. It is from this point that the controversy rages. Do the nonmedullated fibers go into the dentine or do they not? Are the nerve fibers in intimate connection with the odontoblasts or do they just surround the outer surface?

Boll[13] reported in 1868 that he observed fine fibers in the dental pulps of rabbits and guinea-pigs. He traced them between the odontoblasts and even in the dentinal tubules. Morgenstern,[14] a well-known scien-

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5Orban, Balint: Cells of Defense of Pulp and Periodontal Membrane, J. A. D. A. **16**:965 (June) 1929.

6Maximow, A. A.: Morphology of the Mesenchyme Reactions, Arch. Path. & Lab. Med. **4**:557 (October) 1927.

7Goffung, E. M.: Deutsch. Monatsch. f. Zahnheilk., 1928. Blotvogel, W.: Vierteljhrsch. f. Zahnheilk., 1924, p. 185.

8Weil, W. A.: Zur Histologie der Zahnpulpa, Leipsig, 1887.

9Schweitzer, Georg: Über die Lymphgefasse des Zahnfleisches und der Zahne beim Menschen und bei Saugetieren, Arch. f. Mikrosc. Anat. **74**:927-775, 1909.

10Turner, C. H.: Textbook of Operative Dentistry, edited by C. N. Johnson, Philadelphia, P Blakiston's Son, 1917.

11Dewey, K. and Noyes, F. B.: A Study of the Lymphatic Vessels of the Dental Pulp, Dental Cosmos **59**:436 (April) 1917.

12Magnus, Georg: Über den Nachweiss der Lymphgefasse in der Zahnpulpa, Deutsch. Monatsch. f. Zahnheilk., October, 1922, p. 661.

13Boll, Franz von: Untersuchengen über die Zahnpulpa, Arch. F. Mikrosc. Anat. **4**:73, 1868.

14Morgenstern, V.: Deutsch. Monatschr. f. Zahnheilk., 1892, p. 436.

tist, worked on human pulp tissue and reported that he saw bundles of axones surrounded by their medullary sheaths passing into the dentine. He also described special dentinal channels for the axones. He further declared that each canal has two axones and they terminate at (1) the cortex of dentine; (2) the amelodentinial junction, or (3) that they even pass into the enamel.

Mummery,[15] who is said to have done the most research on this subject, came to the following conclusions:

(1) That in actively growing teeth, there is a considerable supply of nonmedullated fibers to the tooth pulp, which are derived from sympathetic ganglia and are not concerned in any way with the sensitiveness of the dentine, their ultimate fibrils probably being distributed to blood vessel coats and secreting cells of the pulp. (2) At the periphery of the tooth pulp, the bundles of medullated nerve fibers lose their medullary sheaths and neurillema, and the axis cylinder expands into a spreading mass of neurofibrils which can be traced directly to the dentinal tubules, which they enter. (3) The nerve fibers enter the dentinal tubules in company with the dentinal (odontoblastic) fibrils.

15Mummery, J. H.: A Short Preliminary Note on the Distribution of the Nerve Fibers of the Dental Pulp, British J. Dent. Sc. 54:482-496 (June) 1911.

1450 Fifty-Second Street.

Legros and Magitot[16] concluded, as the result of their investigations in 1879, that the terminal filament arborizes with the protoplasmic processes of the stellate cells which in turn are in intimate relation with the basal odontoblastic process. Aitchison Robertson[17] believed, however, there was a direct connection between the terminal processes and the basal odontoblastic process.

Working on the mandibular teeth of dogs, cats, and rabbits, Huber[18] in 1898 reported that he saw.

The medullated nerve fibers approach the lower portion of the pulp in one or several relatively large nerve bundles. On reaching the lower surface of the pulp, these large bundles break up into numerous smaller ones, the latter consisting of 8-10 nerve fibers . . . In the fibrous tissue membrane which covers the under surface of the pulp, and which is continuous with the periodontal membrane, these smaller nerve bundles form, as the result of frequent anatomoses, a plexus of medullated fibers . . . On approaching the surface of the pulp, the medullated fibers lose their medullary sheath: the nonmedullated terminal branches, after repeated division, form a plexus immediately under the odontoblasts. They branch and rebranch into long, delicate varicose fibers.

16Legros, Ch. and Magitot, E.: Morphologie du Follicule Dentaire Chez les Mammiferes, J. Anat. et Phys., 1879, p. 248.

17Robertson, Aitchison: Tr. Roy. Soc. Edinburgh, 1891, p. 323.

18Huber, G. C.: The Innervation of the Tooth Pulp, Dental Cosmos 40:797 (October) 1898.

Hopewell-Smith[19] as late as 1918 states that as a result of his researches, he has a strong conviction that the nerve fibers terminate in a basketwork of varicose fibers embracing and often closely attaching themselves to the walls of the odontoblasts.

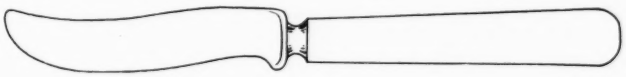
Pont,[20] however, evolved a much more fantastic theory. He asserted that the odontoblasts resemble the peripheral sensory neurones and are, therefore, in reality cells of the nervous system, the dentinal processes of which are the centripetal poles and the basal processes the centrifugal poles.

In Balint Orban's textbook[3] the author states that "The nerve fibers can be traced not only to the dentine, but into the dentine itself, as has been shown by Mummery, Morgenstern and recently Adrion and by Toyoda-Dieck." Before complete acceptance can be given to the preceding statement, further confirmatory proof will have to be given.

19Hopewell-Smith, A.: Some Observations on the Cellular Elements of the Dental Pulp, Tr. Odonto. Soc. Great Britain, new series, 26:9, 1893-1894.

20Pont, A.: De la Cataphorese en Art Dentaire et Plus Specialement dans les Cas de Dentine Hypersensible. Tr. Third Internat. Cong. Paris, 2:233, 1900.

IMPROVED PLASTER SPATULA



Doctor Edwin S. Scott of San Francisco suggests an improved plaster spatula which can be made by any dentist. An ordinary dinner knife, preferably one with a stainless steel blade with a bone or aluminum handle, such as may be purchased at any hardware store, is ground to shape. Because the blade is stiff and shaped to fit the rubber plaster bowl, mixing is easier and quicker.

BACTERIOLOGY

Louis A. Bue, M.D. and J. Arnold Bargen, M.D. of Rochester, Minnesota, report[1] the results of their investigations in a series of 815 strains of the diplostreptococcus isolated from 1,100 patients with chronic ulcerative colitis. Approximately 500 of these strains were injected into 1,000 rabbits. Lesions resembling those seen in the colon of man followed intravenous injection of 65 per cent of the animals. The organism was isolated from the blood stream of eight patients acutely ill with chronic ulcerative colitis.

This diplostreptococcus was isolated from periapical dental abscesses of 148 patients with chronic ulcerative colitis and was injected intravenously into animals. The typical lesions were found in the colons of 75 per cent of these animals. The organism was found in the tonsils of 100 patients with chronic ulcerative colitis and was injected into animals with results identical to those secured after injection of organisms from periapical dental abscesses.

1Bue, L. A. and Bargen, J. A.: Chronic Ulcerative Colitis: A Disease of Systemic Origin, J.A.M.A. 101: 1462-1463 (November 4) 1933.

WHY DENTAL CARIES WITH MODERN CIVILIZATIONS?

VII. FIELD STUDIES OF MODERNIZED AMERICAN INDIANS IN ONTARIO, MANITOBA, AND NEW YORK

WESTON A. PRICE, D.D.S., M.S., F.A.C.D.
Cleveland

INVESTIGATIONS for comparing primitive and modernized races of the earth from the standpoint of immunity and susceptibility to dental caries would be incomplete without including primitive and modernized native Americans; namely, the Indians and Eskimos. They are accordingly herewith presented.

The field and laboratory investigations which I have conducted during the summer of 1933 in further search of light on the etiology and control of dental caries are to be reported in a second series of communications, of which this article is the first report, through THE DENTAL DIGEST. These studies have been made among Indians and Eskimos in widely separated communities or districts in Canada and Alaska, and have included groups in various stages of modernization with as wide extremes as it has been conveniently possible to find. For the groups most completely modernized and living on the interior of the continent which we will study first, investigations have been made in southern Ontario and New York state. Those living in the interior and less modernized and including some relatively primitive groups have been studied in Manitoba and the northerly part of Ontario. Since the two environments studied were distinctly different and provide different types of nutrition; namely, the Pacific coast and rivers where sea foods of various kinds are abundant, and the interior country providing game, it has been important to examine groups existing under these two principal living conditions both with and without contact with modern civilization and its foods. This, my second series of studies,[1] will accordingly be concerned with the modernized Indians of the Canadian and Alaskan Pacific coast and the Pacific watershed for comparison with those of this district not modernized, and with primitive and modernized Indians of the interior.

To find the most nearly primitive groups in the interior away from the fisheries of the Pacific coast and its rivers, it was necessary to go inside the watershed sufficiently far north to get beyond the encroachments of modern civilization. For this a journey was made into the Canadian interior from Alaska across the Rocky Mountain Divide. The studies of these groups will be reported in the March, 1934, installment of this series.

In studying the Eskimos, both modernized and primitive, the field investigations were made in southern, western, and northern Alaska. Data obtained on these groups will be presented in the last two installments of the present series.

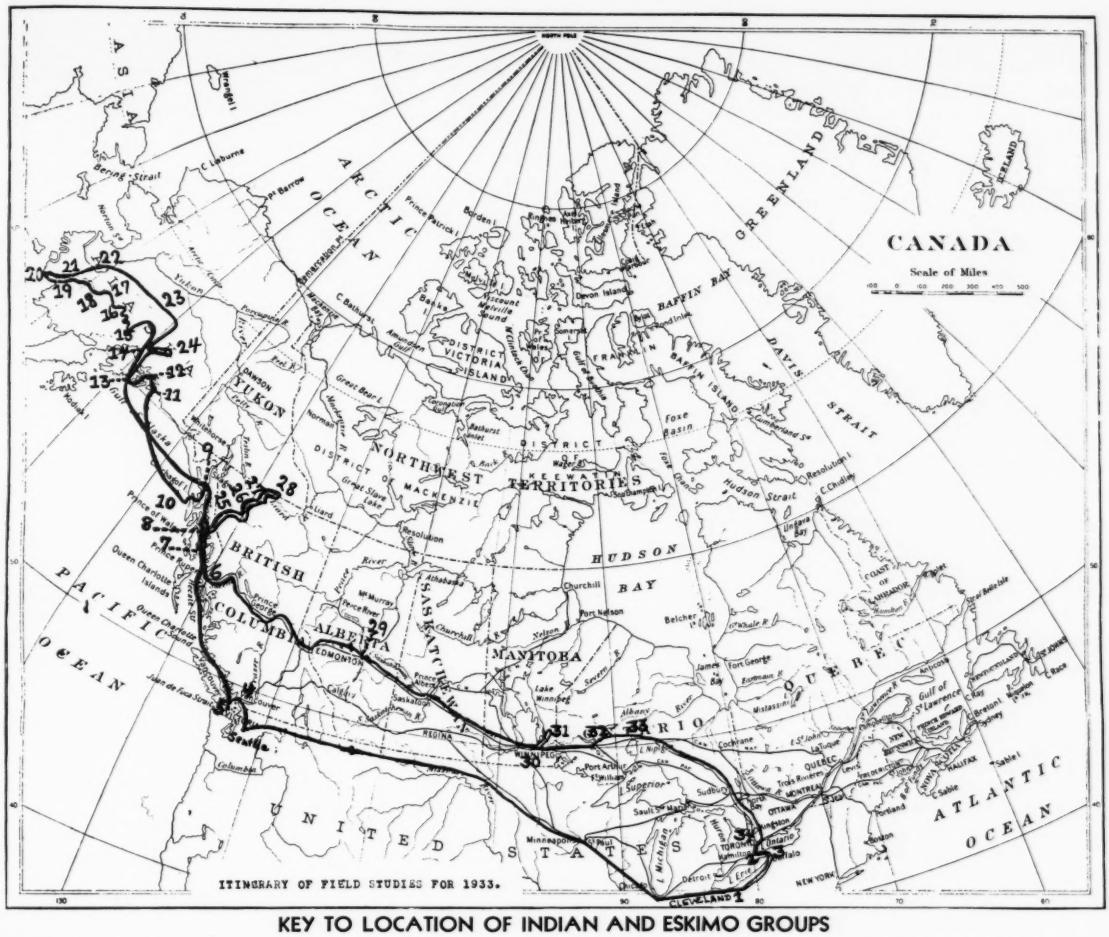
In order that we may more conveniently follow the details and sequence of these various studies a map of the itinerary has been provided and is shown in Fig. 1. The places with which we are concerned are numbered from 1 to 34. Number 1 is the starting place, Cleveland. The first trip was to the Six Nation Reservation in southern Ontario and the Tuscarora Reservation in northwestern New York. These are marked 2 and 3 on the map.

En route to Alaska we proceeded westward to Seattle where arrangements were made with the United States Signal Corps and its Alaskan service for maintaining contact through the Alaska wireless stations and airplane radio equipments. At Vancouver the provincial Indian museum was visited for a study of old Indian skulls obtained from primitive mounds. A group of modernized Indians were studied in a reservation in North Vancouver (number 4). Another modernized group was studied in the Craig Flower Indian Reservation near Victoria, British Columbia (number 5). Large numbers of Indian reservations and settlements exist all along the Pacific coast northward from Victoria and Vancouver, both on the mainland and on the many islands. The next group studied was in Ketchikan (number 7) near the southern extremity of Alaska. Groups on the Skeena River near Prince Rupert (number 6) and at Wrangell (number 8) were studied on the downward trip. At Juneau, the present capitol (number 9), the patients in the American government hospital, native Indians and Eskimos were studied, and in nearby settlements modernized Indian families. At Sitka (number 10) which was the former capitol young men and women were studied at the Sheldon Jackson School as well as in a settlement of the modernized Indians of that city. We then proceeded across the Gulf of Alaska to Seward (number 13) calling on the way at Cordova (number 11) and Valdez (number 12), and then to Anchorage (number 14) by train. This is the principal inlet to the vast territory extending westward to the Bering Sea, northward to the Arctic, and eastward to the northwest territories of Canada.

Except for a short railroad extending north to Fairbanks, the major part of Alaska is without transportation facilities other than by air craft and dog teams. A limited section can be reached during the summer by slow boat on the Yukon. A few trips are made to Nome by way of the Bering Sea. The airplanes are available for use the year round and dog teams for urgent trips in the winter. At Anchorage (number 14) a hydroplane was chartered which carried us and our equipment to various selected points where relatively primitive bands of Eskimos and Indians could be found. For advice as to the location of such bands I am deeply indebted to Doctor Alex Hrdlicka, Curator, Division of Anthropology, Smithsonian Institute, Washington, D. C.

The next largest Alaskan river to the Yukon is the Kuskokwim which, as the Yukon, flows to the Bering Sea. That part of the Bering Sea coast of Alaska between the mouth of the Yukon and Bristol Bay just north of the Aleutian Peninsula is said to be the most primitive district of Alaska. The people live entirely on the tundra along the sea front and on the bays and on the Kuskokwim River and a few of its tributaries. Studies were made at the following places, namely, near the headwaters of the Stoney River (number 15), a branch of the Kuskokwim. This is a part of Alaska infrequently visited by white men. Sleet Mute, Crooked Creek, and Napaimute (numbers 18, 19, 20) are settlements on the Kuskokwim River. Bethel (number 19) has

1 The reports of my first study appeared in The DENTAL DIGEST, from March to August, 1933, inclusive.



KEY TO LOCATION OF INDIAN AND ESKIMO GROUPS

1. (Cleveland, Ohio).
2. Six Nation Indian Reservation, Ontario
3. Tuscarora Indian Reservation, New York.
4. N. Vancouver Indian Reservation, B. C.
5. Craig Flower Indian Reservation, Victoria, B. C.
6. Skeena River, B. C.
7. Ketchikan, Alaska.
8. Wrangell, Alaska.
9. Juneau, Alaska.
10. Sitka, Alaska.
11. Cordova, Alaska.
12. Valdez, Alaska.
13. Seward, Alaska.
14. Anchorage, Alaska.
15. Stoney River, Alaska.
16. Sleet Mute, Alaska.
17. Crooked Creek, Alaska.
18. Napaimute, Alaska.
19. Bethel, Alaska.
20. Kokamute, Alaska.
21. Bethel Island, Alaska.
22. Holy Cross, Alaska.
23. McGrath, Alaska.
24. Eklutna, Alaska.
25. Telegraph Creek, B. C.
26. Dease Lake Indian Reservation, B. C.
27. McDames, B. C.
28. Liard, B. C., Yukon Border.
29. Edmonton, Alberta.
30. Winnipeg, Manitoba.
31. Broken Head Indian Reservation, Winnipeg Lake, Manitoba.
32. Sioux Lookout, N. Ontario.
33. Ombabika, N. Ontario.
34. Toronto, Ontario.

Fig. 1—Itinerary of 1933 field studies in search of primitive Eskimos and Indians in Alaska and Canada for comparison with adjoining modernized groups.

a government radio station. Kokamute (number 20) is at the mouth of the Kuskokwim River on the Bering Sea. Bethel Island is in the Kuskokwim River and is number 21 on the map (Fig. 1). From these various districts on the Kuskokwim we went north and east to Holy Cross (number 22) on the Yukon River just below the Arctic Circle. McGrath (number 23) is west and north of Mt. McKinley. Returning to Anchorage we proceeded north by railroad to Eklutna (number 24) which has a large government school for Eskimos and Indians who come from all sections of Alaska and include both the primitive and the partly modernized. Eskimo and Indian boys and girls were also studied in another government school, the Jessie Lee Home at Seward, (number 13).

Since all of these people had access to the nutrition available in the Pacific watershed, it was desirable that primitive Indians be found who did not have sea food as an important part of the diet and also who could not get modern foods because of their isolation. To reach such groups it was necessary to go into the interior of northern Canada inside the watershed of the Rocky Mountains, a district that has not been penetrated by modern civilization with its commerce and modern foods. This district could not readily be reached by way of the MacKenzie River through northwest Canada. Only two boats a year go into the far north, but it was imperative that we reach districts that were not connected with modern commerce. The route selected after much investigation was up the Stikine River from Wrangell (number 8) to the head of navigation at Telegraph Creek (number 25) and then over the Rocky Mountain Divide by motor truck to the headwaters of the Dease and Liard branches of the MacKenzie River, and down these waterways toward the Arctic to districts so wild that because of their isolation the people of that country are nomadic Indians dependent almost entirely on wild game for their nutrition. These places are recorded on the map as Dease Lake, 26; McDames, 27; Liard, 28. This district is frequently referred to as the dark

spot of the North American continent and has been little explored. We found it frequently referred to as the "impenetrable north." Studies of this district will be reported in the March, 1934, installment of this series.

Retracing our steps to Wrangell we proceeded to the Skeena River, near the mouth of which is Prince Rupert (number 6). Here we studied bands of Indians who come to that district in the summer to take advantage of its remarkable fishing facilities. We were assisted by the Indian agent there and the use of his government boat and crew which took us to these Indian groups. These are all placed on the map as number 6, at Prince Rupert. We then proceeded eastward to Edmonton (number 29) and Winnipeg (number 30) and studied an Indian reservation on Lake Winnipeg (number 31) in which the Indians are highly modernized.

The earliest gateway to the Canadian interior and great northwest was through a chain of lakes and rivers extending northward from Lake Superior and southward and westward from the Hudson Bay and James Bay. We could, accordingly, study groups that had come out of the interior to what is now the farthest north railroad in this part of Canada at Sioux Lookout (number 32) where nomadic groups and a group in the government school were studied. At Ombabika (number 33) which is about half way between Lake Superior and James Bay we studied Indians who had come out of the country as far north as James Bay to trade furs and obtain provisions. These two groups contained some quite primitive members and their families as well as many Indians who were receiving a considerable amount of modern foods.

For these investigations it was necessary to travel from 15,000 to 16,000 miles which took approximately nine weeks' time. These studies included the personal examination of approximately 800 Indians and Eskimos and about 22,000 teeth. About 1500 photographs were made and more than 200 samples of saliva obtained. Large numbers of samples of foods were secured for chemical analysis. Impressions were taken of typical dental arches. Some blood samples were also obtained for chemical analysis from a few special cases.

One of the groups that was selected as being typically modernized and living in Canada was the Six Nation Indians on a reservation near Brantford, Ontario, number 2 on the map. The selection of this group was made at the suggestion of officials of the Indian Department of Canada. The group on this reservation includes approximately 4,700 Indians who belong to the following tribes: Mohawks, Onondagas, Cayugas, Senecas, Oneidas, and Delawares, making up the Six Nation or Iroquois group. A later addition to this group is the Tuscaroras from the Carolinas. While there were many mixed bloods there were also a goodly number of full blooded Indian families, so that there was an opportunity to study comparatively the effects of intermingling of the Indians with the whites.

Fig. 2—This young mother has both extensive tooth decay and marked irregularities of the dental arches.

As in previous investigations a special effort was made to study the children from 8 to 16 years of age. Typical cases were accordingly selected from different environments; for example, the boys and girls in a training school called Mohawk Institute, near the city of Brantford. There are approximately 160 students under training here and we were advised that they study half a day and work half a day. The boys are taught craftsmanship and farming and the girls home economics and garment making and such practical training as would prepare them for home building. While most of the boys and girls come from that reservation, a few are accepted from other reservations. It is of interest that 77 per cent of the children in this institution had suffered from earlier dental caries and that 17 per cent of all the teeth examined had already been attacked by dental caries. But this had occurred apparently before their entrance to the institute for we did not find a single case of active caries among those examined there and this is particularly important in connection with their excellent nutrition which will be discussed later.

The children of this group were compared with children of approximately the same age in a public school of the reservation where it was found that 90 per cent had had dental caries and that at present in 70 per cent the caries was active. It is important to note that in this group 28.5 per cent of all the teeth examined had already been attacked by tooth decay.

A study was made of patients at the reservation hospital where free service of all kinds is provided. We found that 83 per cent had suffered from dental caries and 23.2 per cent of all teeth had already been attacked by caries.

We were particularly interested in the conditions in the homes, especially the condition of mothers. A typical young mother had approximately half of her teeth attacked by dental caries; this was also true of her son, aged 7. It is important to note that the middle third of the boy's face lacked development and that all his upper teeth were decayed to the gum line.

I was interested in seeing these people in their group assemblies, such as in their sports. Accordingly, I managed to be at the reservation on a Sunday when a large number of them turned out to see their national game of lacrosse played between their own team and a visiting team from another reservation. There were several hundred Indians congregated on the athletic field near the center of the reservation and since the reservation covers about 50 square miles they had to use their most available means of transportation. It was of interest to note that the majority of them had driven there in modern automobiles and to find that most of them were wearing modern clothing.

All ages were represented from infants in arms to elderly Indians. The babies were sometimes carried by young mothers, one of whom is shown in Fig. 2. The young woman is 16 years of age and her baby is 6 months old. Note the marked irregularity of her teeth. Something had happened in her childhood that practically never happened with the primitive Indians of her ancestors, for their teeth were always regular and the facial forms were true to type.

Typical cases of arthritis were to be seen at this holiday celebration. Fig. 3 shows an elderly woman whose spine is badly deformed because of arthritis. Note the abnormal development of the abdomen.

When I asked the physician in charge of the hospital what constituted their principal problems he referred the question to the superintendent and her reply was "babies." The physician commented that the problems of childbirth were different with the younger generation in that physical difficulties were frequently encountered. In two deliveries the morning I made the inquiry surgical assistance had been necessary because of imperfect skeletal development whereas in the physician's earlier experiences, as is known from the histories of the Indian tribes, childbirth had been an easy incident in the mother's life. Among the hospital cases was a girl in her "teens" with rheumatic arthritis, and one of 12 years of age with tuberculosis and teeth irregular to the extent that an upper lateral had developed inside the lower arch, and rampant dental caries was present which reduced all the four first permanent molars to mere shells. This girl is shown in Fig. 4. The expense for hospitalization or prenatal and postnatal care is not a problem with these people for the Canadian government generously supplies the physicians and nurses free.

One had a fine opportunity to study the physical development of their best athletes as will be seen in Fig. 5. It is of interest that almost as soon as a little Indian boy is able to toddle he is given a lacrosse stick, so that his training begins early in anticipation of the day when he will be a defender of the honor and glory of his tribe.

The Indians have gone far in the matter of nutrition from the primitive foods of these primitive Americans as will be seen later. The nutrition will be discussed in detail in connection with the foods of primitive bands. Some items should, however, be presented at this point. In the Mohawk Institute an abundance of milk was provided for growing

Fig. 3—Typical deforming arthritis which is frequently found among the modernized Indians.

Fig. 4—This Indian girl, aged 12, is invalided with tuberculosis. Note the marked dental irregularities. Dental caries has been rampant.

boys and girls and both white flour and entire flour breads were available, with an abundance of butter and vegetables. In that group, while 77 per cent had had active caries previously, not one that was examined had active caries at the time. This is in striking contrast with the Oshweken school group in a different district where all are living at home and 70 per cent were suffering from active dental caries. In the latter group only one had been using milk and all had used only white bread. The foods on the reservation were high in calories and low in minerals. This is a general condition and was found to be characteristic in the homes of those who were temporarily in residence at the hospital and those visited in their homes.

A study was made of an Indian reservation in New York state for comparison in making an estimate of typical modern American Indian life with regard to dental caries and nutrition. For this study a band of 450 in the Tuscarora Reservation (number 3 on the map), northeast of Niagara Falls was visited. Here again we were fortunate to see the people in holiday mood since the study was made on Decoration Day and a big event of the year had been set, a lacrosse match and a baseball game between the Indian teams and white teams from adjacent towns. Here again, several hundred were congregated to exhibit their best in wearing apparel, transportation equipment, physical perfection as well as imperfection. There was evidence of uniformity of features which were strikingly true to type in the older Indians who had not been highly modernized and something strikingly deficient in the facial development of many of the moderns. A typical case of high speed degeneration is seen in Fig. 6. The girl's arches are narrow; the mandible was so lacking in development that she had great difficulty in closing her lips which gave the upper teeth the appearance of being abnormally prominent. She is making a distinct effort to close her mouth. When not on guard, she is a typical mouth breather. But she has a modern automobile!

This problem of disturbed facial development can be seen early, as illustrated in Fig. 7 which shows a child, aged 2 years, holding a kitten. Note the narrow nostrils, the forerunner of the dental arch deformities. She already is a mouth breather with an underdevelopment of the middle third of the face, in part, the result of an overgrowth of lymphoid tissue from vitamin deficiency.

A typical mother photographed at

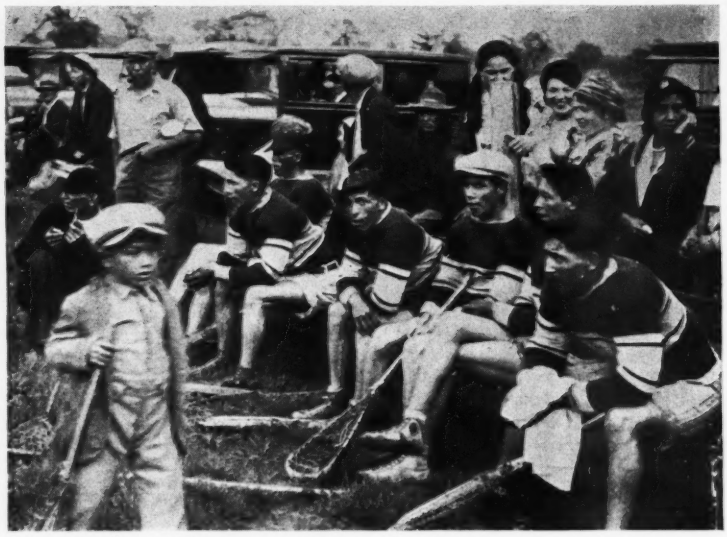


Fig. 5—Lacrosse which is a national game in Canada had its origin with the American Indians. Note the splendid physiques of these athletes.

Fig. 6—This highly modernized Indian girl has so serious a facial deformity that it is with difficulty that she can cover her teeth. She is typical of high speed physical degeneration associated with modernization.

Fig. 7—Facial deformity as a lack of development in the middle third of the face has been established at this early age.

Fig. 8—Unlike the normal experience of the primitive mothers this modernized Indian mother has lost many teeth with the overload of child-bearing.

Fig. 9—This child, aged 4, had rampant tooth decay. She was eating white flour bread called "bannock," jams and practically no milk.

Fig. 10—The process of modernization begins early as illustrated by this Indian boy with his modern carbonated sweetened fruit juice.

her home is shown in Fig. 8. She has four children. Note the ravages of dental caries in her mouth. She was strictly modern with splendid gold inlays in some of her anterior teeth. The roots of the missing teeth had not been extracted. Twenty of her teeth had active dental caries. Her little girl, aged 4, is shown in Fig. 9 and she already has twelve badly carious teeth. Another daughter, aged 8, has sixteen carious teeth, and a son, aged 10, has six. The husband was in bed because of an acute lung involvement. The children were eating their noon day meal when we arrived. The meal consisted of white bread and some stewed vegetables. Milk was available for only the baby.

In this Tuscarora group 83 per cent of those examined had dental caries and 38 per cent of the teeth examined had already been attacked by dental caries. All those studied in this reservation were using white flour products and none were using milk liberally and only a few used it even in limited amounts. I was told that in both reservations a few years ago the Indians grew wheat for cereal and kept cows to provide a liberal supply of milk for their families but recently this practice had been discontinued. They were now buying their wheat in the form of white flour and their vegetables largely put up in cans. In both reservations they were using commercial vegetable fats, jams, and marmalades, sweetened goods, and syrups and confections liberally. It is remarkable how early in life the child likes modern civilization's confections. In Fig. 10 will be seen a little Indian boy, aged 3, enjoying modern carbonated sweetened fruit juice with all the enthusiasm and satisfaction of his modern contemporaries who furnish him his ideals and whose civilization is also rapidly being devitalized by these very processes.

In making an assessment of the physical and dental perfection of the North American Indian it is of course necessary to consider the present status of the modernized Indians of the central part of Canada. For this special studies were made of a group in a reservation on Winnipeg Lake in Manitoba (number 31). These people were reached with much difficulty because of the natural protection provided by the location of their reservation at the mouth of Brokenhead River. They had been provided with fertile land and have been taught modern methods of farming. Their proximity to a great body of water fairly well stocked with fish gave them an opportunity to secure marine foods if they were disposed to make the effort to do so as they had done through previous centuries. Their homes were found to be in a dilapidated condition and while their lands were stocked with cattle and horses, those we found were in poor condition and were limited in number. The people had been provided with a government school and a government agent to assist in providing their needs. They were within fairly easy access to hospitals and had available modern medical service. Notwithstanding all these advantages their physical condition was poor. Dental caries was so rampant that 39.1 per cent of the teeth studied were found to be already attacked by dental caries. The people were living almost entirely on modern foods, im-

Fig. 11—This typical Ojibwa Indian is about 6 feet tall. He and his wife have lived almost entirely on game and fish. Furs are used to purchase modern foods for the growing children who have much tooth decay.

Fig. 12—These splendid teeth of the Indian shown in Fig. 11 are considerably worn but free from tooth decay.

ported white flours, jams, canned vegetables and liberal quantities of sugar. More than 90 per cent of them had rampant dental caries. Their physical condition and their supply of necessities was much lower than in either of the two preceding groups. Distress was evident even in late summer.

Two other groups of central Canada were studied in the northern part of Ontario where the people had come out of the great wilderness south and west of Hudson Bay and James Bay to trade at the posts along the recently constructed railroad. One of these groups is at Sioux Lookout (number 32 on the map), which at one time was the important lookout point of the Ojibwas in their contact with the Chippewas of the south and east. At this point there is a great waterway reaching up from Lake Superior and extending through to Lake of the Woods and Lake Winnipeg and on to the far Canadian northwest. To the north of this post there still exists large districts in which the Indians are primitive. Boys and girls come from some of these remote districts out to Sioux Lookout, as the frontier, to attend a modern school. Schools for the primitive Indians were, of course, unknown. We found here a few splendid physical types who are the product of the primitive methods of living and native foods. We also found highly modernized bands of Indians. A modern government school had been established on a lake about 4 miles distant. Among the Indians who had come out of the interior for modern provisions the health of the children and their physical development was distinctly lower than that

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Fig. 13—The infant children are wrapped in moss and practically live on a board the first year of life. No adult Indians reared on primitive foods were observed to have bow legs.

of the older people. In this group 17.4 per cent of the teeth had already been attacked by tooth decay. In the government school 13.5 per cent of the teeth of the students examined had been attacked by caries at an earlier date since no active caries was found among the students.

Ombabika, number 33 on the map, is on a chain of waterways extending from Lake Superior to James Bay by way of Lake Nipigon to the south and the Albany River to the north. It is now the point of contact with modern civilization for the Indians of a large tract of many thousand square miles extending northward and eastward. At this point we met Indians that had come all the way from James Bay, a few of whom were quite primitive. A colony had established itself sufficiently near the railroad at this point to obtain modern foods and still carry on their trapping and hunting occupations. We accordingly had a group living largely in the wilderness and still engaged in the primitive occupation of trapping but who made sufficiently frequent exchanges of furs for modern foods to permit this diet largely to supplant the native foods. Here 23 per cent of all teeth had already been attacked by tooth decay.

The Indians from James Bay belong to the Sioux tribe and those from the territory more adjacent to Ombabika belong largely to the Ojibwas tribe. Among the older generation were some men and women of fine physiques and with complete freedom from tooth decay, splendid regularity of teeth, and healthy gums. Two views of one of these Indians are shown. Fig. 11 shows his fine physique; he is more than 6 feet tall, and Fig. 12 shows his excellent teeth.

The Indians in different places have customs in the matter of care and nutrition of the papooses or young children. At this place the papooses under 1 year of age were generally wrapped in moss and sewed on to a board. These boards are provided with carrying straps for the back and a headpiece which served both as a guard and as support for a canopy. A typical papoose is shown in Fig. 13. The mother does not need to remove the child from this board for nursing. We found that the children rarely cried unless they were frightened or hungry. Their legs were remarkably straight and developed great strength. Older children were frequently seen carrying heavy loads; sometimes they had a load strapped to the forehead and suspended on their backs while carrying a heavy load in each hand.

In a later installment of this series results of the chemical analyses of the saliva and foods will be presented together with a discussion of the native foods and those which have supplanted them in the various groups. The people of this district have built their fine physiques on native foods which have been limited to animals of the chase, fish supplemented by roots and bark with a limited amount of native fruits and green leaves. This food is in striking contrast with that found in the Pacific coast district which will be the subject of the next installment.

(End of Seventh Installment)

COMING:

VIII. Field Studies of Modernized Indians in Twenty Communities of the Canadian and Alaskan Pacific Coasts.

IX. Field Studies Among Primitive Indians in Northern Canada.

X. Field Studies Among Modernized Eskimos of Alaska.

XI. Field Studies Among Primitive Eskimos of Alaska.

The Editor's Page

OCCASIONALLY, death follows from acute infections of dental origin. The direct cause of death is not often of local septic origin but is the result of the secondary infection of some organ distant from the jaw. Of interest to dentists are two other types of disease with oral manifestations, which may also produce death; namely, agranulocytic angina[1] and fusospirochetal angina.

A series of lethal cases reported by Móczár[2] of the Surgical Service of the Universal Clinic of Stomatology of Budapest is interesting. Móczár describes twenty-four fatal cases ascribed to acute dental infections. In twenty-two of these cases complete autopsy observations are available. Death-causing processes of primary dental origin are divided into three groups: (1) *Descending* infections into the thoracic cavity (mediastinitis, lung metastases). (2) *Ascending* infection into the cranial cavity leading to cerebral complications (meningitis, cerebral abscess, suppurating thrombosis of the cavernous sinus or other sinuses). (3) *Edema of the Glottis* caused by purulent infiltration of the connective tissues progressing toward the pharynx and larynx.

In all fatal cases except one the origin of the infection was in the lower teeth, especially the molars. The third molar was the starting point in half the cases. The lower left teeth are more often involved than the right in the ratio of 16:7. A striking fact is that with one exception the ages of the patients was between 20 and 50, the average age being 35. There were fourteen men and ten women.

Móczár explains the tendency to severe complications in the lower jaw on an anatomic basis. Cellulitis developing in the lower jaw may quickly spread into the intermuscular spaces of the proximating masses of muscles and ascend or descend through the connecting interspaces. Infections in the upper jaw tend to break through the alveolar wall and point toward the surface.

In ten cases infection spread to a distant organ through blood and lymph vessels, the sinuses, and the orbit. General pyemia and septic degeneration of the heart, kidney or liver were rare.

The typical acute attack of agranulocytic angina (agranulocytosis, malignant neutropenia, granulopenia) is usually preceded by two or three days of prodromal symptoms: lassitude, malaise, sore throat. These prodromal symptoms are usually followed by extreme weakness and almost complete prostration. The mortality rate in this disease is about 85 per cent.

The blood picture in agranulocytic angina often presents an almost complete absence of granulocytes *while the total white cell count may or may not be lowered.* Because the oral lesions often present in this condition may be confused with Vincent's infection the dentist should be alert to detect any case of oral ulceration that suggests an overwhelming toxic condition. An accurate differential white cell study and prompt reference to a physician is the safe course in a suggestive case.

Dennis[3] suggests a theory of focal infection to explain agranulocytic angina. In experiments with laboratory animals he inserted sealed parchment capsules filled with 18-hour serum-broth cultures in the abdominal cavity of rabbits. The symptom complex thus produced resembled agranulocytosis in man. *Streptococcus viridans* produced a more violent reaction than *Staphylococcus aureus.* Dennis concludes that pyogenic bacteria that are "restrained from active penetration into the tissues, yet are so situated that their toxic products can be absorbed" are capable of producing disintegration of the granulocytes (agranulocytosis).

In chronic or encapsulated focal infections Dennis believes that the conditions under which the animal experiments were performed are satisfied; namely, inactive penetration of tissues by bacteria with a constancy of the supply of toxin. What possible casual relationship there might be between encapsulated periapical infections and agranulocytosis should be an interesting problem in dental research.

1 Sussman, Samuel: Agranulocytosis, DENTAL DIGEST 39: 153 (April) 1933.

2 Móczár, L.: Mortal Acute Dental Infections of Oral and Dental Origin, Dental Cosmos 75: 781 (August) 1933.

3 Dennis, E. W.: J. Exper. Med. 57: 993 (June) 1933.

MANDIBULAR CAVERNOUS HEMANGIOMA

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New York

HEMANGIOMAS of the cavernous type may be found throughout the body. When situated in the skin or subcutaneous tissues they form the nevus prominens. In the deeper structures and internal organs they occur most frequently in the liver, and less frequently in the brain, spleen, uterus, kidney, intestine, bladder, and the bones. Few mandibular involvements have been reported. When the disease involves the deeper structures, because of the difficulty in hemorrhagic control, it is often fatal.

The *angioma cavernosum* is a type of tumefaction which consists largely of a series of intercommunicating blood spaces, irregular in shape and size, lined with endothelium and surrounded by a variable quantity of fibrillar connective tissue which may contain smooth muscle cells. It resembles the erectile tissue of the corpora cavernosa and the clitoris, and is apparently produced by a dilatation of old and newly formed capillaries and veins. It may be erectile or pulsating in character.

The case to be described was fortunately recognized during its incipient developmental stage; and hence, it has been possible to have a roentgenographic representation of the different phases of the disease and the ultimate apparent cure with evidence of a definite osteogenic process within the jaw.

Fig. 1—Generalized involvement of the right side of the mandible. Note the beginning absorption process at the apexes of the teeth (May, 1927).

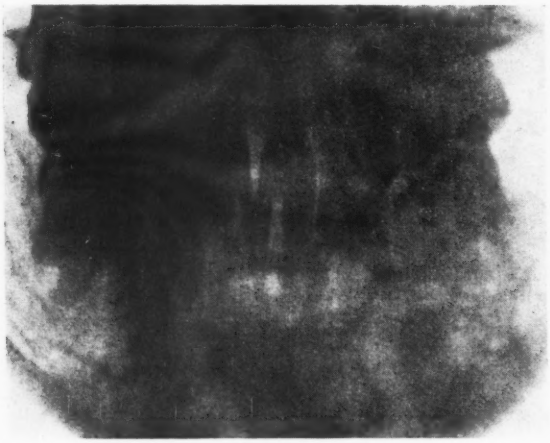


Fig. 2—Anteroposterior view. Note the difference in character of the bone of the right and left rami of the mandible.

Fig. 3—Compare tremendous enlargement of right mandibular canal (top) with apparent normal appearance of left side (bottom).

* From the Dental Service of The Mt. Sinai Hospital, New York.

Fig. 4—Condition just prior to removal of posterior teeth, exemplifying the advancement anteriorly of the disease (May, 1928).

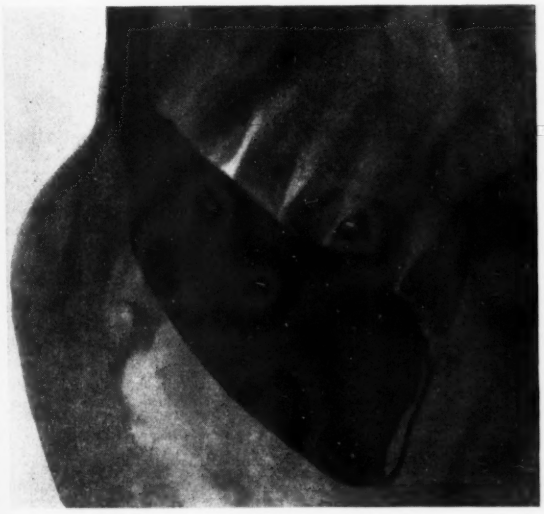


Fig. 5A

Fig. 5B

Fig. 5C

Fig. 5, A, B, and C—Three views of the compression splint in situ (June, 1928).

Report of Case

History—A boy, aged 14, first presented himself at the hospital in April, 1919, with a hemorrhagic condition emanating from the gingivae in the region of the inferior right molar. There was no history of purpura or any other blood dyscrasia. A blood examination was apparently normal with the exception of a lowered hemoglobin as a result of loss of blood through hemorrhage. The tourniquet reaction was negative; coagulation time was three minutes, and bleeding time was five minutes.

Nothing further eventful happened until January, 1926, at which time the patient developed a severe cold and sore throat. For a time following he observed nightly a considerable accumulation of blood in his mouth. On the day of his admission to the hospital, the patient complained of a toothache in the inferior right posterior region. Roentgenographic examination revealed a resorption process about the apexes of the lower right second molar, resulting in the formation of sharp, lancet-like root tips. The tooth was mobile, permitting tongue or cheek movements against it to cause the sharp apical tips to press against the periapical tissues resulting in both pain and occasional hemorrhages.

The blood was again examined and found to be within normal limits. The tooth was then removed under hospital conditions. It literally "popped"

Fig. 6—Note drill holes through the cortex of the bone and the extensive ossification that has taken place during one year (August, 1929).

out of its socket, and this was followed by a tremendous profusion of blood spurting with terrific velocity for some distance out of the mouth, unlike anything previously described in the literature so far as I know. Digital compression on a gauze sponge, and thromboplastin injections which infiltrated and circumscribed the involved area controlled the bleeding. The patient later was permitted to close his mouth on gauze tampons, and a Barton bandage was applied. Changing of the packings or dressings in the socket during the subsequent few weeks occasioned much difficulty because of hemorrhages, but the patient was finally permitted to leave the hospital.

In the course of ensuing periodic examinations there was revealed roentgenographically a rarefaction of practically the entire right side of the mandible. The appearance simulated that of an extensive infection but the clinical symptons were lacking. The patient was under observation for some time when it was decided that surgical intervention was indicated. Diagnoses of phosphorus poisoning and necrosis were easily ruled out.

Physical Examination—The first molar had become perceptibly movable despite the absence of occlusal trauma or gingival infection, and there was already evidence of mobility of the teeth anterior to it. The mandibular canal was many times the normal size and the bone was literally shot with what appeared to be blood vessel protrusions. A provisional diagnosis of aneurysm or cavernous hemangioma of the right side of the mandible was made.

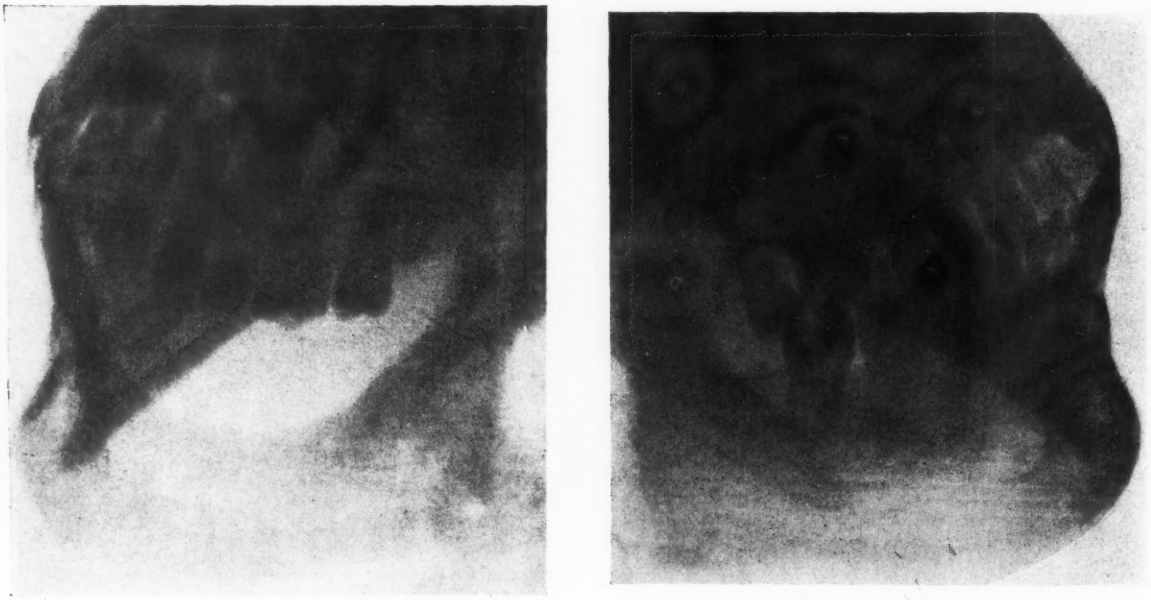
The tongue was clear; the pharynx was somewhat reddened; the tonsils were buried; the right mandibular molar was loose and painful to the touch; two teeth anterior to this were also loose and slightly painful; the adjacent mucous membrane was tender to pressure. A thrill could be felt between the alveolar mucous membrane and the cheek on that side. There were no ulcerations or other involvements in the mouth.

There was a fullness in the right submaxillary region, and a to-and-fro thrill could be felt. A markedly visible pulsation could be seen on the right side of the neck and face up to the lobule of the ear. On auscultation a to-and-fro murmur could be heard. The involved area was tender on palpation.

Operations—January, 1926, the inferior right second molar was removed.

April 8, 1927, a ligation of the external carotid artery on the right side was done.

April 27, 1927, an operation to attempt the obliteration of the mandibular canal by means of employing



A. Involved side **B. Left or Normal side**

Fig. 7—Two views of the jaw one year later (August, 1930).

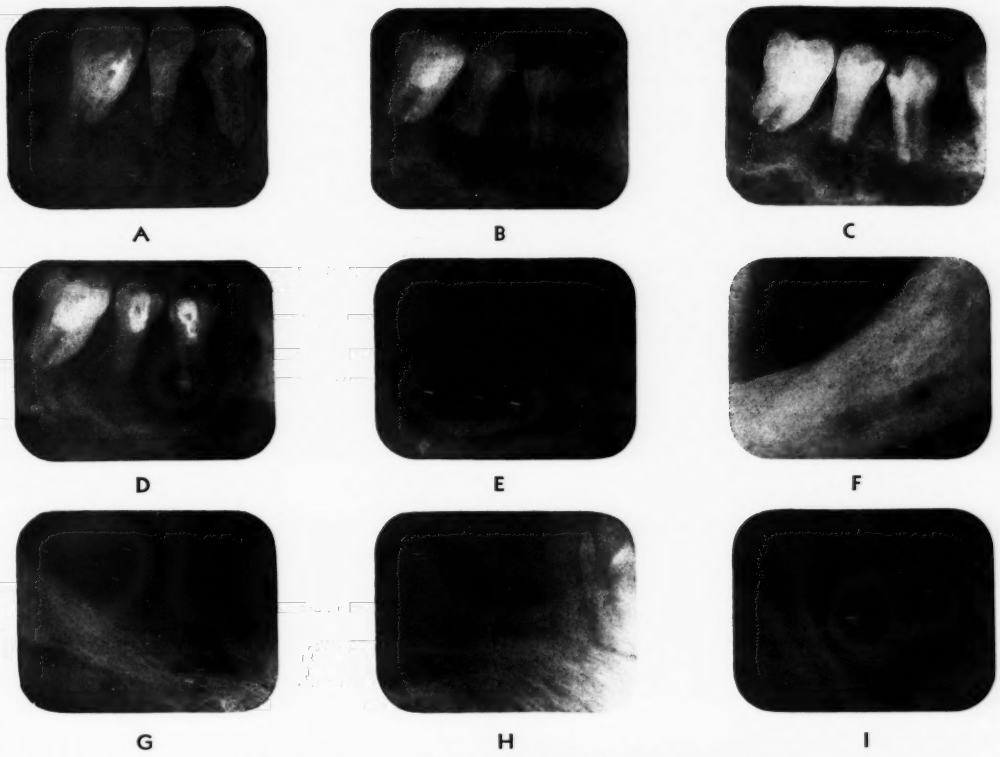


Fig. 8—Roentgenographic representation of the course of the disease.

bone wax was performed. The use of a trephine having been found dangerous, a small gouge was used. Following a single light tap with a mallet applied to the gouge against the trephine cut the circular button of bone was blown out by a terrific hemorrhage. This indicated that the ligation of the external carotid artery had been of no benefit.

May 16, 1928, the inferior right bicuspids and first molar were removed. An attempt was made to control the extreme hemorrhagic spurting by means of digital compression on gauze tampons for a period of twenty-four hours. Nurses were employed for this purpose in shifts, changing every half hour. This attempt to obtain primary coagulation failed, and gauze packings and a Barton bandage had to be used. Four days later the temperature rose to 105.8 F. and the pulse rate to 136. A compound splint was then made to replace the sponges as an aid in establishing hemostasis. The electric suction pump had to be utilized because of the extent of the hemorrhage, for each second was of the utmost importance. Subsequently it was decided to construct a metal compression splint which would not necessitate frequent changing.

During May and June, 1928, five blood transfusions were made. On June 12 the hemoglobin dropped to 28 per cent and a citrate transfusion of 850 cc. was made. It was then decided to ligate the right common carotid artery and the left external carotid artery in order to permit adequate manipulation within the mouth without hemorrhage. The splint was removed and contrary to expectation there was again a prodigious hemorrhage. The right cuspid was forced out of the mouth with the hemorrhage and was accompanied by a large bony sequestrum. This made hemostasis still more difficult. The splint was then enlarged and again plunged back into place.

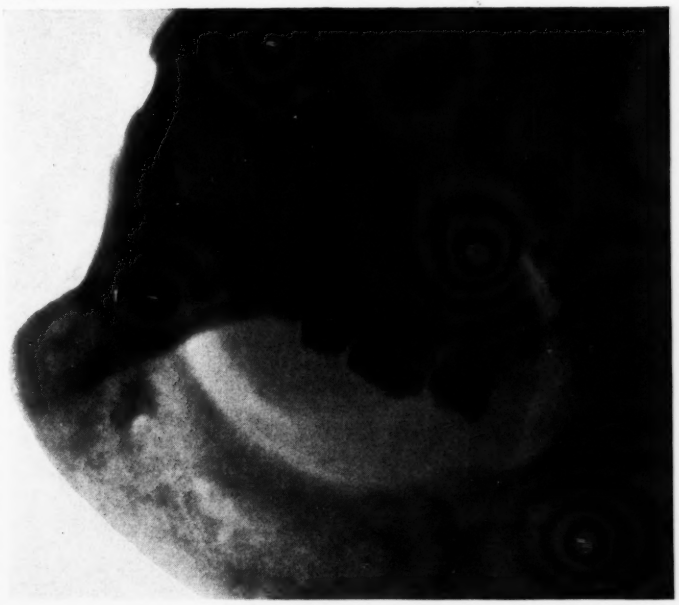


Fig. 9—Condition of jaw in May, 1932. There is no evidence orally of the presence of disease.

In June and July, 1928, two extraoral operations were performed, a flap being laid open to expose the external body and part of the ramus of

the mandible. A series of small holes were drilled into the bone. As the drill was removed from each hole the electrocautery was immediately inserted into the hole, and the blood vessel tissue in the bone with which it came in contact was destroyed. This was quickly followed by the injection of sterile bone wax mixed with lipiodol (an iodized oil). My specially devised wax gun permitted its insertion directly into the drilled hole, and then considerable pressure with the wax was made possible. This procedure unquestionably helped to occlude the many blood vessels scattered throughout the medullary portion of the bone.

July 19, 1928, the compression splint was removed unaccompanied by hemorrhage.

Between July, 1928, and June, 1931, the patient was under close observation, but surgical intervention was not resorted to during this period.

In June, 1931, an additional injection of bone wax and lipiodol was employed to reduce the redness in the region of the internal aspect of the right angle of the mandible. There is now roentgenographic evidence of a definite osteogenic process throughout the involved mandible.

The more recent examinations (September 1933) reveal a continued condensing process in the bone with a gradual exfoliation of the bone wax to the surface of the alveolar mucosa and the mucous membrane of the right cheek.

Conclusion

1. The roentgenographic delineation of the bony involvement from its early stages through the operative stages to its apparent cure makes this a particularly interesting study, because after a careful investigation of the literature I was unable to find any roentgenographic representation of the disease in its various stages.

2. The mandible is still intact. It was not necessary to resort to resection.

3. The result was apparently accomplished through two major procedures: (*a*) the mandibular compression splint which acted as a hemostatic and also compressed the bone so that the hypervascular development was constricted, thus resulting in an atrophic process; (*b*) the injection of bone wax under pressure into the medullary portion of the bone, thus occluding the vessels with which it came in contact.

4. The patient is apparently normal and now anticipates plastic (cosmetic) surgery to help eliminate the facial and neck cicatrices.

205 West Fifty-Seventh Street.

USES OF LIQUID PETROLATUM IN THE DENTAL OFFICE

LLOYD E. MUSBURGER, D.D.S. and ELIZABETH A. BARRETT, D.H. of Jamestown, North Dakota, suggest the uses of liquid petrolatum as shown in the accompanying illustrations.

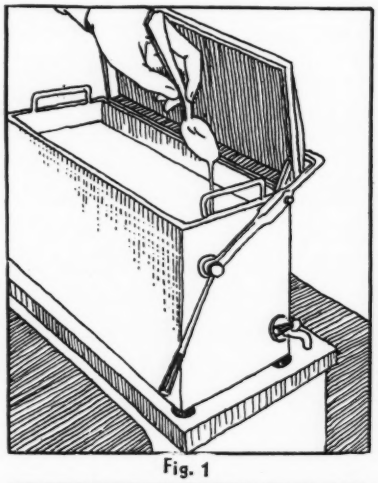


Fig. 1

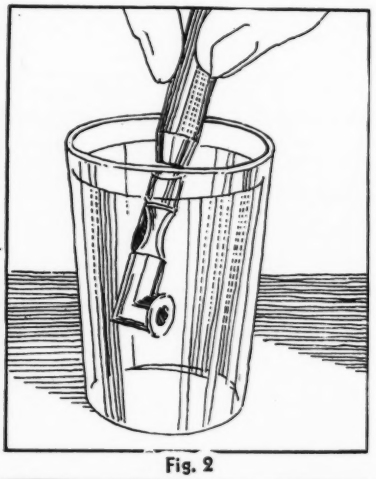


Fig. 2

Fig. 3

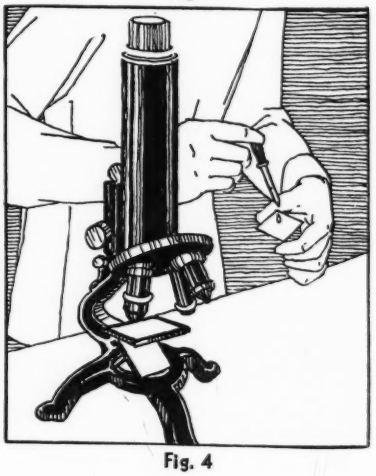


Fig. 4

Fig. 1—A tablespoonful per quart of water in the sterilizer acts as a rust preventive. In sections of the country where water is hard and contains iron, without the use of the petrolatum, instruments become corroded on boiling. Petrolatum enables one to use artesian well water for sterilization by boiling.

Forceps joints will not become gummed even if they are not thoroughly dried after each boiling.

Fig. 2—If the petrolatum is run into one aperture and out the other of contra-angles, it will clear out all old oil and rust. It does not cause clogging of the small gears as do some other oil removers. It acts as a lubricant although it is probably better to oil contra-angles after cleaning. Petrolatum works best when thinned slightly by heating.

Fig. 3—Petrolatum protects the hands if it is rubbed on them before cleaning the office or doing laboratory work.

Fig. 4—Petrolatum is better than cedar oil for microscopic work with oil immersion lens. It does not gum either lens or slides even if left indefinitely. Petrolatum is inexpensive, and it has the proper index of refraction.

MODIFIED METHOD OF MAKING CAST GOLD CROWNS

E. P. LIENEMANN, D.M.D.

Seattle

THE preparation of the tooth for the reception of the cast gold crown need not be discussed. Only the materials used for this attachment are of concern here:

1. A properly fitted copper band is necessary which is filled with compound, and an accurate impression is taken. The impression is examined for discrepancies (Fig. 1).

2. Instead of using amalgam or cement for the model I would suggest the use of Coecal (gypsum plaster) mixed to a rather thick consistency and vibrated into the impression until filled (Fig. 2).

3. With the excess Coecal a mound is formed on a piece of paper and the filled impression is seated on the mound, thus giving enough material to form a root, or handle when the plaster has set (Figs. 3 and 4). As this plaster sets rapidly, it will take only fifteen minutes.

4. A sharp knife is used to trim the plaster to the band with a resulting cylindrically shaped model with a band *in situ* (Fig. 5).

5. Place in warm water for a few minutes and separate.

6. The model is then trimmed as for an alloy model to place it in the impression for articulation (Fig. 6).

7. Before assembling, allow the model to dry and coat the end to act as a root with collodion; when dry, lubricate with cocoa butter.

8. Now assembling is done as for an alloy model, a plaster articulator being made, or the model may be mounted on an articulator frame. The operator is now ready to make the pattern for the casting.

9. Three coats of collodion are applied to the prepared end down to 0.5 mm. from the finishing margin. This acts as a piece of tin foil would —to eliminate etching—and gives space for cementation (Fig. 7).

10. Coat or lubricate with cocoa butter and melt on the liquid inlay wax roughly and bulky enough to enable removal after chilling. When the operator is certain it will come off and on, it may be carved to anatomic form and articulation.

1029 Medical-Dental Building.

Fig. 1—Copper band.

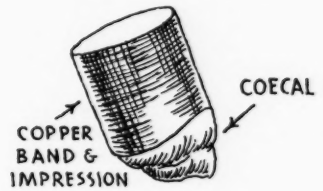


Fig. 2—Copper band and impression, showing Coecal.

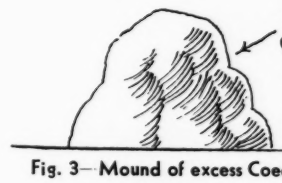


Fig. 3—Mound of excess Coecal.

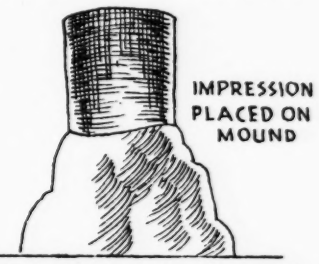


Fig. 4—Impression placed on mound.

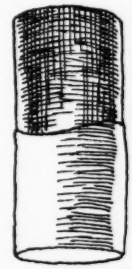


Fig. 5—Impression trimmed to band.

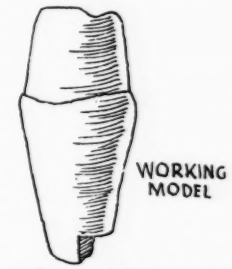


Fig. 6—Working model.

Fig. 7—Three coats of collodion (flexible) applied to cover to 0.5 mm. from the finishing margin. Indelible lead is dissolved in the collodion. (With a sharp knife the indelible lead is scraped to form a powder. The scraping is done into a wide necked bottle which contains flexible collodion. This is done until the desired color is obtained. The lead dissolves readily. Shake well).

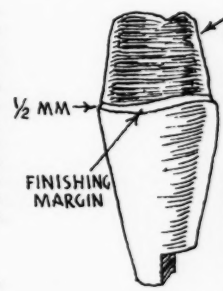


Fig. 7

Fig. 8—Waxed and ready for investing.

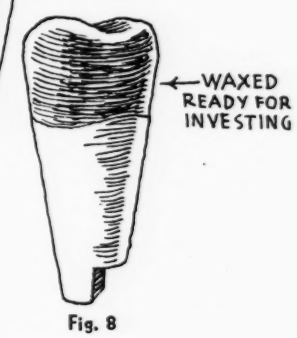
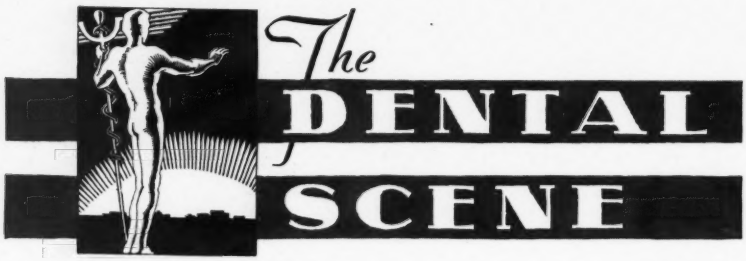


Fig. 8

11. Remove, invest, and cast (Fig. 8). Incidentally, a high heat expansion investment is recommended.



TRANSITION

MEDIOCRITIES may stand on a pivot and try to stop the world from going round —may attempt to arrest the transitory, but the inevitable transition which treads almost imperceptibly through writing, dancing, drama, music, conversation, stampedes theatrically through social changes. In the "eternal flux," the "perpetual motion" in living, adamant convictions vie with one another—some are determined to go upstream; others to drift downstream; still others would stem the current; a few would have "a river become a pond." The varied convictions are contradictory. But the presence of contradictions means that conditions are awry; that is, there is the opportunity to lend a hand or an idea in the readjustment process, and the occasion is ripe for ". . . all the lucubrations of all those master-builders of the public weal, of those who advise all the poor to enslave themselves, and of those who persuade them they are all dethroned kings."

I observe the philosophy of the man who beat a beggar asking for alms only to cause the beggar to straighten up energetically and beat his adversary in turn. The philosopher boasts, "By my energetic medication, I had restored to him pride and life." He says to the beggar, *"Sir, you are my equal!* Kindly do me the honor of sharing my purse; and remember, if you are truly philanthropic, that you must apply to all your colleagues, when they ask for alms, the theory that I have had the *sorrow* of trying on your back."

I am one of the *spectators* in the Platonic classification of the social order. My convictions, if I have any, do not matter. But as I sit in the editorial sanctum, I am compelled to observe and ponder the convictions and philosophies of others. Letters arrive from Utah, Ohio, Texas, Washington suggesting emergency relief programs or asking advice about a particular community or individual problem. The telephone rings to announce a special committee meeting of the Industrial Diagnostic Service. I read proofs of the abstract of "Rules and Regulations Governing Medical Care Provided in the Home to Recipients of Unemployment Relief." An interested subscriber sends us a news item from the *Kansas City Star* carrying the headline 'A MENACE TO DENTISTS': STATE PANEL PLAN WOULD RUIN THE PROFESSION IT IS SAID.' Other pertinent items from the clipping bureau are received. "State-panel-dentistry phobia"; "private practice threatened"; "dental dole"; "Final Report of the Committee on the Costs of Medical Care"; "compulsory health insurance"; "adequate care for the indigent and low-wage group"—all these become familiar expressions in the editorial precincts.

"Specialists in human liberty" bite caustically and unrelentingly into the laments of the defenders of the elusive and impossible *status quo* and these in turn gnash the altruistic verbiage of the advocates of socialized dentistry. I know nothing of these utopian obsessions, but I listen to the protean differences and imagine the successful establishment of one or another so-called ideal social system.

I recall an account by a favorite author in which a rich child with his gleaming toy talks through the grating around his garden to a child of the poor whose plaything is a white rat. "And the two children were laughing together fraternally with teeth of equal *whiteness!*" We would like to think that some day it would not be rare thus to observe "teeth of equal whiteness." However, as we consider, for example, what is regarded as adequate emergency care in the "Rules and Regulations," actuality fails so far to reflect the glow of theoretical brilliance.

My meditations bring with them the recollection of another story in which the heroine has a predilection for "doctors." One day she mistakes the profession of one of the characters. "But," he asks her, "What makes you think I am a doctor?" "It's because you are so amiable and good to women!" Perhaps I sympathize with this heroine too much. When I think that some day all medical and dental care may be had only in socialized institutions, personalities loom up in the future as though out of the past, and prematurely, I regret the passing of a confidence, an admiration, an understanding, and an individual human concern of a certain "amiable" physician and a certain "amiable" dentist who were "so good to women." And I continue to think into the future as though in retrospect, "I am glad I was not born too late to know those personalities: my friends, the family doctor and the family dentist."

—*E. H. D.*

ABOUT OUR CONTRIBUTORS

RALPH HOWARD BRODSKY has his D.M.D. from Harvard University (1922). He is the associate editor of the *Harvard Dental Record*, and the author of A COMPENDIUM FOR THE PEDIODONTIA CLINIC, New York, 1930. Doctor Brodsky has conducted numerous researches at the Heckscher Foundation Dental Clinics during eight years as director, and also at Mt. Sinai Hospital. He has recently concluded a three-year extensive dietetic study in collaboration with Cornell Medical School (Department of Pediatrics), and the New York Nursery and Child's Hospital. Doctor Brodsky is a member of the A.D.A., the New York State Dental Society, the First District Dental Society of New York, Harvard Odontologic Society, and an active Fellow of the Harriet Newell Lowell Society for Dental Research. Doctor Brodsky has a general practice with oral surgery predominating.

ELDON L. KNOX received his D.D.S. from Northwestern University School of Dentistry in 1911. Doctor Knox has previously contributed to the dental literature. He was professor of dental pathology at Baylor University in 1922 and of crown and bridgework from 1923 to 1925 inclusive. He was a member of the Board of Councilors in 1923, 1924, and 1925 and is honorary professor of restorative dentistry of St. Louis University, St. Louis. Doctor Knox is a member of the A.D.A., charter member of the Academy of Restorative Dentistry; member of the Texas State Dental Association; Dallas County Dental Association; and associate member of the Chicago Dental Society; honorary member of Southwestern Dental Association; member of West and East Texas Dental Societies; Delta Sigma Delta. Doctor Knox's practice is limited to restorative dentistry.

HENRY H. SKLOW received his D.D.S., in 1929 from Tufts College School of Dentistry, Boston. He had a year's interneship at the Forsyth Dental Infirmary, Boston, and was formerly on the dental staff of the Manhattan State Hospital, Wards Island, New York (1930-1933). Doctor Sklow is a member of the A.D.A., the New York State Dental Society, and Tufts Study Club of New York, and he is engaged in the general practice of dentistry.

RALPH CHARLES MATTESON received his D.D.S. in 1905 from the Chicago College of Dental Surgery. Doctor Matteson has previously contributed to the dental literature in collaboration with Allen C. Starry, M.D., of Sioux City. He is a member of the A.D.A. Iowa State Dental Society, Northwestern District Dental Society, The American Society of Oral Surgeons and Exodontists, and Delta Sigma Delta. Doctor Matteson is on the staff of St. Joseph's Mercy Hospital and the Methodist Hospital of Sioux City, and his practice is limited to exodontia.

BENJAMIN B. KAMRIN received his B.Sc. from Columbia University and his D.D.S. in 1931 in the School of Dental and Oral Surgery (Columbia). Doctor Kamrin was a contributor to the old DENTAL DIGEST and has written for num-

(*Continued on page* 75)

LETTERS TO THE EDITOR

"I have reread the article in the December, 1932, DIGEST by Sidney Sorrin, D.D.S., of New York, on "Periodontal Disease: Diagnosis and Treatment." The author is certainly to be congratulated on this article as being right on the nail head, very timely, and instructive. There are not enough such articles in our magazines that hit the fundamentals. Not many dentists place on the treating of periodontal disease the importance it deserves, as the gum tissue is the very foundation of mouth conditions and should have first consideration. But does it?

"I would like to know if Doctor Sorrin uses a pyorrhea astringent and stimulant during his treatment. If so, what?"—H. G. CENELY, D.D.S., *Severy, Kansas.*

ANSWER—Your letter has been forwarded to me and I wish to thank you. . . . I do not use any astringent in the treatment of periodontal disease; the only stimulant that is used is a toothbrush. The brush applied properly to the periodontal tissues is one of the best means of stimulating the tissues to health.—SIDNEY SORRIN, D.D.S.

"In commenting on the Emergency Dental Relief Administration, what provisions are made for the eventual outcome of the dentist? None! To serve the public at actual cost will place the dentist shortly with the masses. The government pays a profit for groceries, boots, shoes, automobiles, trucks, etc., why not a fair profit for dental services, which, any one should know, is always earned.

"I have always been interested in helping in charity work, and will continue so long as I can conscientiously do so, but at present we have a different picture and the situation must be handled with extreme care.

"The government spends millions to treat and raise good pigs; let's try to get the government to focus its attention on children and forget pigs for the time being."—E. T. TANNER, D.D.S., *Jefferson City, Missouri.*

ABOUT OUR CONTRIBUTORS

(*Continued from page 69*)

erous other professional periodicals. Doctor Kamrin has done research in histology and work on fetal jaws at New York University and in biochemics of caries at Columbia University. As a First Lieutenant in the Dental Reserve Corps Doctor Kamrin is the visiting dental surgeon at Fort Hamilton, U. S. Army and he is a member of the A.D.A. and component societies and the American Association for the Advancement of Oral Diagnosis. Doctor Kamrin has a general dental practice.

DOCTOR LLOYD E. MUSBURGER'S professional biography appeared in THE DENTAL DIGEST, September, 1932, in which issue his article, VINCENT'S INFECTION, was published.

EDMUND PAUL LIENEMANN received his D.M.D. in 1919 from the North Pacific Dental College, Portland, Oregon. Doctor Lienemann is a member of the American Dental Association and the Seattle District Dental Society. He is engaged in the general practice of dentistry.

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